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ELECTRONICS AND ELECTRICAL ENGINEERING

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USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

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STABILITY OF AUDIO-FREQUENCY SINUSOIDAL OSCILLATION GENERATOR

RYAZANOV, B. P., Smolensk Branch, Moscow Power Engineering Institute

[Abstract] An audio oscillator incorporating two amplifiers and am amplitude
regulator based on integrated circuits and operating in the 2-200 Hz band
with a 5V amplitude constant is described. The functional and schematic dia-
grams of the device are traced and analyzed. A formula is derived for cal-
culating the basic relationships in the oscillator circuit. The working
model is described which incorporates K140UD8 circuits for the amplifiers
and 10 K140UD8V and K553UD1A operational amplifiers for the oscillator. The
structure employed can also produce signals at frequencies below 2 Hz by
using the appropriate time constant in the integrator. The paper is recom-
mended by the Department (Kafedra) of Automatics and Telemechanics.
Figures 2; references: 2 Russian.
[36-6900]

SPECTRA OF POWERFUL NOISE PULSES PROPAGATING IN NONLINEAR MEDIA

DEMIN, I. Yu., Gorkiy State University

[Abstract] This study investigates the spectrum evolution of spread-
spectrum pulses whose propagation is described by Burger's equation. Three
characteristic stages of spectral transformation are examined as a strong
pulse propagates through a nonlinear medium. The pulse is shown to undergo
a process in which discontinuities merge, after which the initial pulse
is transformed either to a triangular wave or to a N-wave, which occurs over
long propagation paths. The author thanks S. N. Gurbatov for Statement of
the problem and constant attention, to the work, and A. N. Malakhov for

consideration of the results obtained. References 5: 4 Russian, 1 Western (in Russian translation).
[33-6900]

CHARACTERISTICS OF RADIO SIGNAL DETECTION USING ACOUSTOELECTRIC EFFECT

BORITKO, S. V., GULYAYEV, Yu. V. and MANSFEL'D, G. D.

[Abstract] The results of a theoretical analysis and experimental verification of the possibility of employing an acoustoelectric detector for AM and FM radio signal demodulation and for synchronous detection as presented. A theory of the acoustoelectric effect is developed for acoustic wave propagation in a layered piezodielectric-semiconductor structure, and for the simultaneous propagation of two waves. The theory is verified experimentally on a layered structure consisting of an $LiNbO_3$ piezodielectric and a CdSe semiconductor film. It is shown that a detector employing the acoustoelectric effect provides high gain, a steep characteristic slope in FM detection, and a wide dynamic range. Figures 6; references 12: 8 Russian, 4 Western.
[6-6900]

DEVICES FOR FREQUENCY SHIFT TO SUPPRESS ACOUSTIC FEEDBACK

KOROLEV, L. D.

[Abstract] Shifting of the audio-frequency spectrum is a key method for reducing acoustic feedback while increasing amplification. The physical nature of devices for frequency shift dictates their placement after the microphone amplifier in a sound system. The present article describes various designs of such devices in terms of the structure and demands for phase shift, in which electromagnetic transformers have insufficient voltage transmission, devices utilizing 90° induction transformers, where accompanying amplitude modulation of the initial signal remains a problem, and devices with 120° induction transformers, such as selsyn transformers. Practical use of such devices must take account of their broad-band characteristics. Although their constant frequency control offers important advantages, for some types of music their spectral shift can result in unacceptable distortion. Figures 3; references 4: 3 Russian, 1 Western.
[20-12131]

NONLINEAR PROCESSING OF OPTICAL PULSE SIGNALS

RUMYANTSEV, K.Ye.

[Abstract] The method of sequential statistical analysis is applied to
space processing of optical pulse signals, for the purpose of shortening
the scan time. The likelihood ratio is accordingly calculated upon arrival
of each successive sample and then checked against its upper bond
$\log(P_{det}/P_{f.a.})$ and lower bound $\log[(1- P_{det})/(1- P_{f.a.})]$ (P_{det} - proba-
bility of correct detection, $P_{f.a.}$ - probability of false alarm). The
expression for the likelihood ratio depends on the approximation used for
the distribution density of the photoreceiver output signal. Statistical
simulation of the photodetection process has revealed that the gamma distri-
bution $w(x_i)= \int x_i^{\alpha-1} e^{-\int x_i} / \Gamma(\alpha)$ is a close approximation. Considering
that the time constant of electron flight between dynode stages is inversely
proportional to the photoreceiver bandwidth, with the constant coefficient
in this relation varying from 0.048 to 0.036 for most commercial photo-
multipliers with 8-14 stages, the statistical characteristics of the photo-
receiver output readings and the necessary sample size are calculated as
functions of the statistical characteristics of the photoreceiver input
signal and noise. The optimum photoreceiver bandwidth is then also deter-
mined on this basis, depending on the input signal-to-noise power ratio.
Figures 1; tables 1; references: 7 Russian.
[310-2415]

METHOD FOR ANALYZING REMOTE- AND SELF-GUIDANCE SYSTEMS UNDER AMBIGUOUS CONDITIONS

VORONOV, Ye. M. and KARPENKO, A. P., Moscow Higher Technical Training School imeni N. E. Bauman

[Abstract] This study examines the problem of finding the optimum (guaranteed) control for a program-controlled target deviating from a collision with a remote- or self-guided object with partially unknown characteristics. Allowance is made for the specifics of the remote- and self-guidance systems, the unsteadiness of the systems and the nature of the "prototype." The problem is solved in three stages in accordance with the principle of restricted complexity. Analogous results are obtained for a complexity functional which restricts the integral required accelerations of the center of mass of the object. A numerical example which demonstrates the effectiveness of the method is presented. The paper is recommended by the Department (Kafedra) of Automatic Control. Figures 3; references: 4 Russian.
[32-6900]

METHOD FOR INCREASING RESOLUTION OF CODING DEVICES FOR INTERFACING SHIP-BOARD NAVIGATION-GEODETIC SENSORS WITH COMPUTER

BASKAKOVA, I. V., GOLOVINA, L. I. and MEYER, V. V., Ryazan Radio Engineering Institute

[Abstract] A combined high-resolution method is examined for converting the angular positions of inductive sensors to code by dividing the region in which the angle is measured into a number of sectors by generating a system of polyphase signals and then performing analog-digital conversion within the sectors. The method employing the polyphase system of signals is more accurate than the method now in use; the sum of two samples in adjacent sectors is formed in order to compensate for operating errors and zero drift of the analog-digital convertor. The block diagram of the angle-code converter is presented. A device employing the combined analog-digital angular position conversion method is implemented in the interface system for the YeS1010 on-board computer. The code conversion error for the course, speed and distance traveled does not exceed 0.1°, 0.05 knots and 0.01 miles when induction sensors belonging to accuracy class 1 are used. The paper is recommended

by the Department (Kafedra) for the Design of Electronic Computing Equipment.
Figures 3; tables 1; references: 2 Russian.
[32-6900]

OPTIMIZATION OF ORIENTATION IN NAVIGATION BY TWO HEAVENLY BODIES

AZBUKINA, N. A. and VASIL'YEV, V. A., Leningrad Branch, Moscow Technological
Institute

[Abstract] A general optimum solution is presented for problems of triaxial
orientation and joint determination of coordinates and course from two
heavenly bodies for small deviation angles. The direct least squares method
is shown to be best geometrically and statistically for estimating the
three-dimensional vector of rotation using four deviations from two heavenly
bodies. The choice of heavenly bodies for orientation in order to obtain
the most accurate estimate is discussed. The paper is recommended by
the Department (Kafedra) of Higher Mathematics, Physics and Chemistry.
Figures 5; references: 3 Russian.
[32-6900]

ERRORS OF ANALOG OF INERTIAL COORDINATE SYSTEMS MODELED IN ASTRONAVIGATION
SYSTEM

KARAKASHEV, V. A., ANUCHIN, O.N. and PADERINA, T. V., Leningrad Institute
of Precision Mechanics and Optics

[Abstract] Modeling errors of the inertial coordinate system in the computer
of an astronavigation system are derived as a function of the direction
finding errors and errors in the stored equatorial coordinates of the ob-
served heavenly bodies. The relationships derived between the analog errors
and errors in the stored equatorial coordinates can be used to analyze and
synthesize astronavigation and integrated navigation systems. The paper is
recommended by the Department (Kafedra) of Airborne Control Instruments.
Figures 7; references: 3 Russian.
[32-6900]

USE OF SHANKS TRANSFORMATION FOR SPEEDING UP ADAPTATION PROCESS IN ANTENNA ARRAYS

GRUBRIN, I.V., ZAROSHCHINSKIY, O.I. and SIMOYLENKO, V.I.

[Abstract] Use of the Shanks transformation is considered for speeding up optimization of the weight vector during adaptation in antenna arrays by the method of steepest descent. The transient process for each weight factor is evaluated accordingly as the sum of m exponent terms, m being smaller than or equal to the number of adaptation channels and 2m+1 readings of the mean weight vector sufficing for determination of its optimum value. Since it is not possible to estimate exactly the optimization error as a function of the deviations from the mathematical expectations of weight factors and as a function of the transient response parameters, this is done only approximately: with m+1 readings during the transient period and with a Shanks transformation based on three readings. A theoretical analysis reveals that the error can be large, determined principally by the smallest eigenvalue of the correlational interference matrix. Numerical simulation and a comparative analysis of the results reveal how much faster the algorithm of the Shanks transformation converges than other adaptation algorithms such as those of "the instantaneous mean", "the sliding mean", and "independent averaging." Figures 1; references 7: 6 Russian, 1 Western.
[310-2415]

ANALYSIS OF THRESHOLD EFFECTS DURING ESTIMATION OF ARRIVAL TIME OF OPTICAL SIGNALS

TRIFONOV, A.P. and YENINA, Ye.P.

[Abstract] The maximum-likelihood estimator and the Bayes estimator of signal arrival time are compared with respect to accuracy in the case of optical signals. Both estimators require computation of the likelihood ratio by the signal receiver, a quadratic cost function being assumed for the Bayes estimator. Conditional and absolute dispersions of estimates, which characterize the accuracy of estimates, are calculated for a Poisson process using the Laplace asymptote. Anomalous errors are taken into account in the important case of small signal-to-interference ratios. The threshold signal-to-interference ratio is lower for the Bayes estimator, but the accuracy of the latter is only minimally higher, when the signal arrival time has a uniform a priori distribution. The accuracy of the Bayes estimator becomes increasingly better than that of the maximum-likelihood estimator, as the distribution of signal arrival time deviates from a uniform one toward a sharply peaking one. An optical signal with Gaussian intensity distribution is considered as a practical example. Figures 1; references 9: 8 Russian, 1 Western (in Russian translation).
[310-2415]

ELECTRODYNAMIC THEORY OF MICROSTRIP LINE WITH FERRITE SUBSTRATES

LERER, A. M., MIKHALEVSKIY, V. S. and SHCHUCHINSKIY, A. G.

[Abstract] An effective elecrodynamically rigorous method is developed for calculating the characteristics of natural waves in microstrip lines on ferrite substrates for three directions of magnetization of the substrate (normal to the surface and tangential along or across the strip). The properties of the propagating waves are investigated on the basis of the calculated dispersion characteristics, characteristic impedance and surface current distribution on the strip conductor; the behavior of these parameters are studied for each direction of the gyrotropic axis of the ferrite. Figures 7; references 18: 13 Russian, 5 Western.
[6-6900]

DIFFRACTION MODELS OF IRREGULARITIES OF STRIP AND SLOT LINES WITH SUSPENDED SUBSTRATE

NIKOL'SKIY, V. V., NIKOL'SKAYA, T. I. and BELOVA, T. G.

[Abstract] The construction of diffraction models of irregular elements of an ordinary asymmetrical stripline, which can be represented as a system of segments of different regular lines, is extended to multilayer structures with flat conductors in different layers. A theory of irregular multilayer structures with flat conductors is developed at the electrodynamic level. Strip and slot irregularities are analyzed for the case of a suspended substrate, and for strip-slot components. A comparison of the results with findings from the literature for regular strip-slot structures indicates basically satisfactory theoretical and experimental agreement. Figures 15; tables 2; references 10: 8 Russian, 2 Western.
[6-6900]

ANALYSIS OF EFFECTIVENESS OF PARTIAL OPTIMIZATION OF SPATIAL PROCESSING SYSTEMS

ABRAMOVICH, Yu. I., GURKINA, L. A. and DANILOV, B. G.

[Abstract] Partial optimization methods are examined for spatial signal processing in order to suppress interfering signals in the side lobes of the directivity pattern. Three methods are examined for forming the group of tunable elements: the first M of N elements, equidistant and quasi-random selection of elements in the aperture. It is found that when there are fewer interfering signals to be suppressed then there are degrees of freedom and quasi-random distribution produces the best results. Selecting the elements "sequentially" is less effective, because the suppression of interfering signals in this case entails significant losses in directional gain. Partial optimization is shown to provide significantly improved noise suppression effectiveness. References 8: 7 Russian, 1 Western.
[6-6900]

POTENTIAL EFFECTIVENESS OF SPATIAL PROCESSING IN DETECTING SIGNALS AGAINST
BACKGROUND OF INTERFERING REFLECTIONS

CHERNYAK, V. S.

[Abstract] This study assesses the potential possibilities for spatial
compensation of interfering reflections and signal detection against the
background of interference in the main and side lobes of the directivity
pattern of antenna arrays, and in systems employing separate antennas.
The signal/(interference plus noise) ratio at the output of an optimum (in
terms of likelihood ratio) detector is investigated as a function of the
angular extent of the family of interfering reflectors and the angular
offset of the objects from the center of the family of interfering reflec-
tors. The possibilities of "spatial compensation" for interference are
examined. The results for a single transmitting antenna are extended to the
case of several interfering antennas. The maximum achievable gain in signal/
noise ratio is found for an object located near the center of the family of
interfering reflectors for spatially coherent antenna systems and transmit-
ting antennas. Analogous results can be obtained for spatially incoherent
antenna systems and transmitting antennas. Figures 2; references 8: 4
Russian, 4 Western.
[6-6900]

DETERMINATION OF ROW-AND-COLUMN CONTROL PRINCIPLE OF PHASE ANTENNA ARRAY
FROM AMPLITUDE-PHASE DISTRIBUTION OF FIELD IN APERTURE

KOLODNIKOV, V. I. and TARTAKOVSKIY, L. B.

[Abstract] A row-and-column control principle is derived for flat phased
arrays with air (efirnom)-fed elements by employing the amplitude-phase
distribution of the field in the antenna aperture. The use of the measured
amplitude-phase distribution as initial information makes it possible to
allow automatically for a number of design errors and characteristics of
phase antenna arrays. The relative directional gain of an array is calcu-
lated as a function of the focal length for different aperture diameters with
row-and-column control. The proposed algorithm for finding the row-and-
column control principle was checked on a mathematical model of a flat array
of a circular aperture and air (efirnom)-fed elements. The results agree
well with the analytical findings. Figures 2; references: 1 Russian.
[6-6900]

SLOW SURFACE MAGNETOPLASMA WAVES IN OBLIQUE MAGNETIC FIELD

BAYBAKOV, V. I., DAPKO, V. N. and KISTOVICH, Yu. V.

[Abstract] New effects are demonstrated which arise when the external magnetic field is applied obliquely to the magnetized semiconductor in a system employing slow surface magnetoplasma waves propagating along the surface of the semiconductor. An experiment employing a surface-wave high-pass filter is described. It is shown that a surface wave propagating along the wave guide reacts only to the tangential component of the magnetic field and is magnetically sensitive to that component which is normal to the surface. It is suggested that this selectivity is associated with the formation and readjustment of the internal structure of the surface-wave waveguide mode. This feature must be taken into account in order to understand the specifics of waveguides for surface magnetoplasma waves and magnetic-field measuring devices based on them. Figures 2; references 2: 1 Russian, 1 Western.
[6-6900]

ELECTRODYNAMIC THEORY OF PERIODIC MICROSTRIP LINES WITH FERRITE SUBSTRATE

IVANOV, V. N., LERER, A. M. and SHCHUCHINSKIY, A. G.

[Abstract] An electrodynamic method developed elsewhere for analyzing the characteristics of single microstrip lines with ferrite substrates is extended to the case of periodic lines. The algorithm developed is employed to analyze and investigate the properties of characteristic waves in periodic microstrip lines for three different magnetization directions of the ferrite substrate (normal to the surface of the substrate and tangential along or across the strips). The dispersion characteristics and characteristic impedance of periodic microstrip lines are analyzed for arbitrary phase shifts of the fields between adjacent strips; wave propagation characteristics are examined for each direction of the gyrotropic axis of the substrate. The algorithm is implemented as a BESM-6 computer program (written in ALGOL-GDR). Figures 8; references: 8 Russian.
[6-6900]

STRUCTURE OF FREQUENCY MODULATED AND PHASE-SHIFT KEYED SIGNALS REFLECTED
FROM IONOSPHERE AT NEAR-CRITICAL FREQUENCIES

NAMAZOV, S. A., ORLOV, Yu. I. (deceased) and FEDOROV, N. N.

[Abstract] The structure of frequency-modulated and phase-shift keyed
radio signals distorted as the result of dispersion effects as well as
leakage of spectral components through the ionospheric layer is investigated
in the region of the critical frequency. Linear frequency modulated (LFM)
signals reflected from an ionospheric maximum region and approximated by
a symmetrical Epstein layer are examined. The dispersion distortions of
LFM sounding signals reflected from the maximum region of an isotropic
ionospheric layer are analyzed. The dispersion distortions of LFM signals
reflected from a magnetoactive ionospheric layer are examined in a longitud-
inal propagation approximation. The dynamics of the development of distortions
as the ratio ω_0/ω_{cr} varies are traced. LFM signal compression by the ionos-
phere is investigated numerically and analytically; conditions are examined
under which a maximally compressed reflected signal with the greatest amplifi-
cation can be obtained. The use of beam representations on the basis of
the space-time geometric theory or diffraction makes it possible to predict
and interpret distortions of complex signals. Figures 5; references 9:
8 Russian, 1 Western.
[6-6900]

DISPERSION PROPERTIES OF MOVING IONOSPHERIC PERTURBATIONS

GRIGOR'YEV, G. I. and DENISOV, N. G., Scientific-Research Radiophysics
Institute

[Abstract] The phase and group velocities of moving perturbations caused
by distant distributed and point sources are analyzed. Horizontally moving
perturbations in a thin layer are found to have the form of quasi-monochromatic
waves with frequency and wave number related as $k=\omega^2 t/\omega_g z$. This relationship
can be viewed as a dispersion equation which, for a fixed t, defines the
group velocity of horizontally moving perturbations: $d\omega/dk=r/2t$. The basic
parameters of moving perturbations (in a flat ionospheric layer) associated
with acoustic gravity waves from a localized pulsed mass source are estimated.
Horizontally moving ionospheric perturbations are found to have the same
structure as pressure wave perturbations in a neutral atmosphere, and will
consequently have the same dispersion properties as are established for
acoustic gravity waves. References 6: 2 Russian, 4 Western.
[33-6900]

INFLUENCE OF FARADAY EFFECT IN IONOSPHERE ON NONMUTUALITY OF METEOR RADIO CHANNEL

SIDOROV, V. V., KHUZYASHEV, R. G. and PLEUKHOV, A. N., Kazan State University

[Abstract] An algorithm for analyzing a nonmutual meteor radio channel is examined for the case of normal incidence of the radio waves on the meteor trail. The meteor trail is modeled as an infinite plasma cylinder with Gaussian permitivity across the radius. The length of the meteor path is a function of the aximuth angle of the cylindrical coordinate system; the amplitude and phase of the scattered signals are nonmutual. The maximum values of the difference phase are found to be of the same order as the time derivative of the phase, indicating the accuracy of the model constructed. Figures 2; references 4: 3 Russian, 1 Western (in Russian translation). [33-6900]

REFLECTION THEOREMS FOR SOME ANISOTROPIC MEDIA

KRASIL'NIKOV, V. N. and TYUKHTIN, A. V., Leningrad State University

[Abstract] This study considers the problem of a field described by an arbitrary differential equation (system of equations) in half-space with a Dirichlet or Neumann boundary condition on the plane. Mirror reflection theorems are constructed for a point source of electromagnetic waves in a moving dielectric, a magnetoactive plasma and a crystal. Special cases of the application of the mirror reflection theorem are examined. The versions of the mirror reflection theorem examined indicate that a discontinuity in the properties at the location at the ideal mirror is characteristic for anisotropic media; therefore, the new boundary problem provides no computational advantages over the initial one. The general rule for constructing mirror reflection theorems may sometimes coexist with reflection theorems for the case in which the properties of the medium continue beyond the mirror: in this case the problem consists of finding a field in an unbounded medium, which exploits the computational advantages of the approach. Figures 2; references: 4 Russian. [33-6900]

RADIATION OF FLAT LOGARITHMIC SPIRAL ON LOSSY DIELECTRIC LAYER

GOROBETS, N. N., YELISEYEV, A. I., LYTOV, Yu. V. and NOSENKO, O. N., Kharkov State University

[Abstract] Ramsey's analytical solution of the problem of electromagnetic wave radiation by a flat spiral in free space is extended to the case in which a spiral driven by an outside source rests upon a lossy dielectric layer. It is found that flat spiral antennas on dielectric substrate of finite thickness are not frequency-independent with regard to input impedance or directional and polarization characteristics. Manufacturing tolerances have more effect on the limits of applicability of such antennas in the upper end of the microwave band than do losses in the substrates. As the permitivity of the substrate increases, flat spiral antennas radiate a high-amplitude field toward the dielectric. Thin dielectric substrates which provide sufficient mechanical strength for flat spiral antennas have practically no influence on the characteristics of the antennas. Increasing the permitivity of the substrate narrows the bandwidth of flat spiral antennas. Figures 6; tables 2; references 4: 2 Russian, 2 Western (in Russian translation).
[33-6900]

TRANSFORMATION OF ELECTROMAGNETIC WAVES IN PLASMA WITH RANDOMLY-HETEROGENEOUS MAGNETIC FIELD

BELLYUSTIN, N. S. and RAYEVSKIY, M. A., Scientific-Research Radiophysics Institute

[Abstract] The linear transformation of electromagnetic waves in a plasma with a randomly heterogeneous magnetic field is examined for arbitrary wave propagation direction with respect to the magnetic field. It is found that linear transformation of normal waves is significantly more effective than for the case in which the wave propagates along the external magnetic field. The influence of linear transformation on the Faraday rotation frequency of the ellipse of polarization is investigated. The statistics of the Stokes parameter are studied on the basis of the Einstein-Fokker-Planck equation. The behavior of the first and second moments of the Stokes parameters are studied in detail. Quantitative estimates are made for the solar chromospheric plasma. Analogous estimates indicate the importance of statistical transformation effects for propagation of electromagnetic waves in the earth's magnetosphere and in laboratory plasma. The authors thank N.G. Denisov for attention to the work and discussion of the results. References 9: 8 Russian, 1 Western.
[33-6900]

EFFECTIVE IMPEDANCE OF STATISTICALLY ROUGH IDEALLY CONDUCTING SURFACE

BRYUKHOVETSKIY, A. S., TIGROV, V. M. and FUKS, I. M., Institute of Radio
Physics and Electronics, Ukrainian SSR Academy of Sciences

[Abstract] Electromagnetic scattering on a statistically rough surface is
investigated. It is shown that, in the general case, a rough surface for
which the spatial-angular spectrum of the irregularities is arbitrary is
described by an effective impedance tensor whose nondiagonal elements are
responsible for the appearance of a depolarized component in the reflected
coherent signal. The phase velocity of a weakly attenuating intrinsic sur-
face wave captured by such a surface is a function of the propagation
direction, and with elliptical polarization in the general case (rather than
linear in the vertical plane). The connection between the diagonal elements
of the impedance tensor (which determine the coefficients of coherent
reflection of vertically and horizontally polarized waves) and the integrals
of the scattering index of the random field is identified. References:
6 Russian.
[33-6900]

FLUCTUATIONS DURING OBSERVATION OF EXTRATERRESTRIAL SOURCES FROM OUTER SPACE
THROUGH EARTH'S ATMOSPHERE

GURVICH, A. S., Institute of Atmospheric Physics, USSR Academy of Sciences

[Abstract] A model is proposed to describe random heterogeneities in the
index of refraction in the atmosphere which makes allowance for sphericity
of the atmosphere. The correlation functions of the phase fluctuations
behind the equivalent phase screen are calculated. The phase fluctuation
spectra are expressed in general form through the spectra of the index of
refraction. The influence of atmospheric sphericity and anisotropy of the
heterogeneities on phase fluctuations of the transmitted radiation are
examined using a Gaussian correlation function of the index of refraction
as an example. Simple formulas are derived in the form of single integrals
which connect specified spatial spectra of the relative fluctuations of the
refraction with the spectra of the wave phase fluctuations. It is shown that
calculation of the second moments of the phase for isomeric heterogeneities of
the index of refraction yields the same results for the proposed atmospheric
model as for the assumption that the relative fluctuations of the index of

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refraction are a statistically homogeneous random field. The author expresses deep appreciation to V.I. Tatarsk for fruitful discussion and valuable comments. Figures 1; references 16: 12 Russian, 4 Western. [33-6900]

STUDY OF NOISE CHARACTERISTICS OF MOTION PICTURE CAMERAS

VINOGRADOVA, E. L., GOLUBEVA, G. I. and LIBERMAN, M. Yu., All-Union Scientific Research Institute for Cinematography

[Abstract] Background noise from motion picture cameras is an important factor in movie quality. Design elements and particularly camera vibration from the electric motor and film advance gears have been studied previously; the present article reports on determination of a coefficient of sound emission by both mathematical and experimental means. The mathematical model was judged to be oversimplified in comparison with actual equipment. Experiments on the other hand showed distorting vibrations to be maximum at the initial cassette speed, when the entire flat cassette surface showed cophasal oscillations. In general the film cassette was judged to be the chief source of noise emission from equipment among the various components that vibrated during operation. Rigidity of design components also had an important role in projecting unwanted noise. The noise levels can be reduced by insulating in order to eliminate or block the effects of vibrations. Figures 7; tables 1; references: 5 Russian.
[20-12131]

STEREOPHONIC SOUND IN TELECASTING

KOVALGIN, Yu. A. and ODNOL'KO, V. V., Leningrad Electrical-Engineering Institute of Communications imeni M. A. Bonch-Bruyevich

[Abstract] The first Soviet studies of stereophonic sound for telecasts were begun in the 1970s, but support was lacking because the overall level of television reproduction. Now, with very high quality pictures, interest is turning to an improved sound. The present article covers the range of sound problems, including variations in sound at studios, on the one hand, and

sports facilities, theaters, etc., on the other. Speaker sizes offer fur-
ther technical obstacles to the introduction of stereophonic sound. Special
advantages of such innovations for the USSR include the possibility of
offering different languages on separate sound channels, thus accommodating
the multi-national character of the country. Improvements are also required
in the fidelity of monaural sound as a first step to stereophonic high
fidelity. Insulation of sound and video tracks of TV equipment, domestic
Soviet polar modulations, and potential picture distortion offer further
likely difficulties, but research is being continued. Aspects of American
and Swedish approaches to stereophonic television sound are summarized.
A key feature is development of two completely separate channels for sound to
insure the practical advantages of stereophonic sound. The "ABC-stereo"
system with its approach to forming the stereopanorama and the acoustical
system is recommended, especially as screen size increases. Figures 8;
references 17: 12 Russian, 5 Western.
[20-12131]

CALCULATING FORM OF SECAM CALIBRATING SIGNAL FOR THE PURPOSE OF RECORDING
IT IN MEMORY OF DIGITAL COLOR BAND GENERATOR

DEPARI, Zh., "Telediffusion de France", France

[Abstract] Progress in high-speed digital technology has promise for
developing analog video signals. The present article reports on devices
with two phases of operation, which may coincide. The first phase
includes calculation and storage of the signal, while the second relates to
inherent aspects of the device itself. A schematic drawing of the SECAM
color generator is explained and general information on its implementation,
using a FORTRAN program, is summarized. Calculations begin with determina-
tion of low-frequency distortions and amplitude restrictions, then proceed
to process the desired low-frequency signal elements, frequency modulation,
high-frequency distortions, synchronization, filter factors, and picture
quality factors, including "ghost" images and other distortions. Quantiza-
tion on 8 bits provides a theoretical range of 1/256, or 0.4% of the
maximum signal range. A theoretical noise level of 1% was confirmed experi-
mentally; the noise level did not exceed 36 decibels on a "Thompson" decoder.
Figures 5; references: 2 Russian.
[20-12131]

TELECINE CONTROL ROOMS FOR FOURTH-GENERATION TELECENTERS

KARAL'NIK, N. A. and TIMOFEYEV, V. Ye.

[Abstract] Creation of major television centers, such as that for the 22nd
Olympic games, confirmed the value of centralizing technical equipment
while retaining specialized control rooms for particular programming needs.
Modern solid state transformers for picture signals, such as those produced
by "Rank Syntel" and Telefunken, offer new stages in automation for the
"fourth generation" of telecine control rooms that provide both the desired
centralization and flexibility for specific types of programs. Certain
difficulties arise, however, that are related to the compatibility of older
equipment and the new technology. Intermediate video-recorders can partially
resolve such problems until state-of-the-art digital transmission on
domestic Soviet equipment becomes possible. References 4: 1 Russian, 3
Western (in Russian translation).
[20-12131]

CAMERA NEEDS FOR EDUCATIONAL TELEVISION

PUSHKAREV, Yu. P.

[Abstract] Non-broadcast television systems, such as closed-circuit educa-
tional television, use different types of equipment than that of broadcast
programs. The present article discusses differences between broadcast
cameras, where the actual signal is often formed in amplifiers, as contrasted
to the self-contained educational cameras. Specific details of the latter
types, such as transmission tube, type of scanning, optical system design
and synchronization, require simpler components than are currently available.
Current cameras for school purposes also lack a sound channel, and the tele-
phone communications sometimes suggested are not really suitable for school
TV use. Another problem is found in modulating sound and picture signals
using present carrier frequencies. The author recommends development of
"vidicon" or charge communication devices that would provide economical,
miniaturized cameras for school use. In developing new equipment, designers
must provide automated, miniaturized and dependable cameras for education
television use.
[20-12131]

SV-23 DIGITAL-TO-ANALOG CONVERTER

GOZBENKO, V. P. and TSYKALO, N. D., Kirovograd Radio Components Plant

[Abstract] The article describes the SV-23 Digital-to-Analog converter that is a component of the SK-81 synchronizer produced by the Kirovograd Radio Component Plant. The device is diagrammed and its key features highlighted. The digital component includes a memory bank, a decoding matrix and a support voltage source, while the analog part has a buffer cascade, a pre-amplifier, a low-frequency filter and a post-amplifier. The code corresponds to a serrated analog signal and to impulses of a "meander" type tactile frequency. The test model was displayed at the "TELECOM-83" International Exhibition in Switzerland. Figures 2; references 4: 3 Russian, 1 Western.
[20-12131]

ALL-UNION SEMINAR FOR CHIEF ENGINEERS, MAY 1984

[Abstract] The proceedings of a seminar for chief engineers of cinestudios and industrial cinematographical enterprises, held at the premises of "Goskino" (State Film Studio) of the USSR in May, 1984, are summarized. S. A. Solomatin, vice chairman of Goskino, charged those in attendance to improve artistic, technological and ideological levels of cinematography in the Soviet Union in his keynote speed. Modern automated technology was stressed. The 26 papers presented addressed problems of equipment and innovative filming, the quality of film and other equipment, and general improvements in facilities. Specialization and subsequent cooperation between individual studios was the topic of several papers. The ideological tasks posed in implementing resolutions of the CPSU Central Committee and the Council of Ministers were further topics of discussion.
[20-12131]

LENINGRAD SCIENTIFIC AND TECHNICAL CONFERENCE, MARCH 1984

[Abstract] The proceedings of the regular scientific and technical conference of the Leningrad Institute of Cinema Engineers and of Leningrad film organizations are summarized. In his keynote speech, M. V. Antilin, rector of the institute, emphasized the need for a comprehensive approach to improvements in the field. Papers presented projected advances in the

field into the 21st century. Special interest groups discussed recording and reproduction of both picture and sound and their evaluation, movie equipment improvement needs and achievements, automation of cinematographic processes, movie film quality improvements and ecological considerations related to its production and development, savings of silver oxide used in films, use of new synthetic and organic dyes, tints and other preparations in film processing, use of silver halides in infrared photography and movies, and semiconductor technology applied to cinematography.
[20-12131]

FREQUENCY TRANSFORMER FOR CONTROLLING TV TRANSMITTER PARAMETERS

SLYUSARCHUK, V. D., chief engineer, Kirovograd Radio Products Plant and YABLONSKIY, A. I., senior engineer

[Abstract] The authors describe a special supplementary unit used in conjunction with a Czechoslovakian TV transmitter monitoring device. It consists of a frequency transformer which transmits the spectrum of radio signals of the decimeter wave band or the intermediate wave band to one of the channels of the third TV band. The device has two mixers and a broad-band linear amplifier. The electronic systems of both mixers and the linear amplifier are described. The mixers use printed circuitry on glass textolite, as does the amplifier. Any filter that divides the bands can be used, and without a filter, operation is still possible, with some increase in the signal-to-noise ratio. Test use has shown that signals of 0.18 to 0.2 W, and of 0.7-0.8 from the heterodyne, can be suppressed. Figures 4.
[5-12131]

INVESTIGATION OF DIFRACTION METHOD FOR MEASURING OPTICAL FIBER DIAMETER

LAZAREV, L. P. and MIROVITSKAYA, S. D., Moscow Institute of Radio Engineering, Electronics and Automation

[Abstract] The possibility of increasing the accuracy and reliability of the diffraction method for testing cylindrical optical fibers 50-250 μm thick. In the diffraction method, the diameter of the dielectric cylinder is found by measuring the distance between the first minima of the diffraction field while eliminating the cylinder with a homogeneous plane wave incident perpendicular to its optical axis. A diagram of a diffraction testing device is presented. The diffraction method improves accuracy in drawing optical

fibers. The diameter measurement results indicate that the relative error is 1.5% for optical fibers 50-250 μm in diameter. Figures 6; tables 4; references 2: 1 Russian, 1 Western.
[36-6900]

THEORETICAL ANALYSIS OF DISCRIMINATION CHARACTERISTICS OF DOUBLE LOOP SYSTEM OF AUTOMATIC FREQUENCY CONTROL IN AN ATOMIC FREQUENCY STANDARD

KOZLOV, S. A. and LOGACHEV, V. A.

[Abstract] The discrimination characteristics of the phase-locked loop system in an atomic frequency standard with the crystal oscillator frequency locked to the atomic discriminator frequency and the discriminator microwave cavity frequency locked to the crystal oscillator frequency. The slope of the discrimination characteristics is computed as a function of the parameters of the phase-modulated signal and of the discriminator. Optimum frequencies and modulation indexes are defined; the influence of frequency pulling of the crystal oscillator by the cavity is examined. The authors express appreciation for S. I. Pavlov's assistance during conducting calculations on an electronic computer. Figures 9; references 5: 3 Russian, 2 Western.
[33-6900]

MODERNIZATION OF TV-5/0.5 KW BAND-III TELEVISION TRANSMITTERS

KOL'TSOV, A. A. and LOKSHIN, A. M.

[Abstract] Modernization of the TV-5/0.5 band-III television transmitter in order to improve performance, power and operating indicators and to eliminate the distortion caused by feedback in the comparatively powerful tube-type stage during modulation is discussed. A new solid-state oscillator modulator section for modifying the video channel is described. This section performs frequency multiplication and modulation at a relatively low power level and then amplifies the modulated signal to a level sufficient to excite the power amplifier. An analogous section, minus the video modulator, is employed in the audio channel, in which only the output tube-type amplifier is retained. The structural diagram of the reconstructed part of the video channel is presented, along with schematic diagrams of the three-stage

power amplifier, the output section and frequency triplers. At the station the modification procedure eliminates 100 radio tubes and drops the power consumption by 3 kW; the HF oscillation phase stability is improved significantly, and the mean time between failures can be tripled. The effectiveness and feasibility of the reconstruction has been demonstrated by tests at Kishinev, Gomel', Alma-Ata, Volgograd, Tartu and Tbilisi. Figures 5; references: 4 Russian.
[3-6508]

PTKS-2 MOBILE TELEVISION MONITORING STATION

OMEL'CHENKO, L. V., BONDAR', L. M., SHAGANOV, N. N. and LYASHENKO, A. I.

[Abstract] The PTKS-2 mobile television monitoring station, which makes it possible to test the parameters of radio broadcast and television signals taken from the air, is described. The system is carried in a UAZ-452V truck, and is capable of measuring the electromagnetic field intensity of TV and radio broadcast stations, as well as radio interference between 0.1 and 1000 MHz; testing the modulation percentage of AM signals from radio broadcast stations; measuring the parameters of TV circuits with the help of test signals generated by the system; visual video monitoring; monitoring the operation of radio stations operating between 0.15 and 73 MHz; magnetic-tape recording and playback of audio signals; and photographing the television screen image and oscilloscope screen. The block diagram of the device is presented and analyzed. Figures 1; references: 2 Russian.
[3-6508]

STATISTICAL WORD SYNCHRONIZATION IN DIGITAL TELEVISION SIGNAL TRANSMISSION

KOGAN, S. S. and SOKOLOV, V. N.

[Abstract] The resistance of statistical word synchronization to communications channel errors in pulse-code modulation systems is investigated. Methods for implementing statistical word synchronization are outlined; the resistance of statistical word synchronization to loss of synchronization is analyzed. An experimental investigation of the noise tolerance of statistical word synchronization is presented. It is found that the probability of spurious loss of synchronization is negligibly low for transmission accuracy for which the probability of switching of transmissions at the analog-digital convertor output with the greatest "weight" exceeds the

probability of corruption of the digital signal in the communications channel. It is possible to exclude service sync information from the digital stream in a transmitted SECAM broadcast TV signal. When this is done, the synchronization time is of the order of several dozen TV scan lines. Figures 3; tables 2; references 8: 6 Russian, 2 Western.
[3-6508]

PHYSICAL QUANTITY-TO-TIME INTERVAL CONVERTER EMPLOYING CORRECTION OF STATIC CHARACTERISTICS OF TRANSDUCER

IL'NITSKIY, L. Ya. and VOLKANOVSKI, M., Kiev Institute of Civil Aviation Engineers

[Abstract] A functional diagram is presented for a converter which simultaneously linearizes the transducer and converts its information parameter to a proportional time interval. The transducer, which works with non-electrical quantities, is based on functional converters connected in series. Formulas are presented for calculating the basic error of the device. The system is employed in a test in which the energy characteristics of SF-1 and SF2-12 photoresistors are linearized. The nonlinearity of the conversion characteristics was less than 1%. The paper is recommended by the Department (Kafedra) of Antenna-Feeder Devices. Figures 2.
[32-6900]

FIBER-OPTIC ANGULAR COORDINATE CONVERTERS

KUDINOV, N. V. and MARKOV, P.I., Mogilev Machine Building Institute

[Abstract] The construction of fiber-optic positional read-out and serial read-out coordinate converters is examined. The error inherent in real-time systems is discussed. The use of coding to reduce the conversion error is explained. A diagram of an electronic module which eliminates code read-out ambiguity is presented. The paper is recommended by the Department (Kafedra) of Electrical Engineering. Figures 4; references: 4 Russian.
[32-6900]

CIRCUITS & SYSTEMS

DESIGN OF FILTERS WITH WIDE ELIMINATION BANDS

KOZLOVSKIY, V. V. and BERDYSHEV, V. P.

[Abstract] A method of suppressing parasitic transmission through microwave
filters is proposed, namely adding multistep transmission line segments with
antiresonances at multiple frequencies to the conventional resonating homo-
geneous transmission line segments. In this way the zeroes of the input
impedance of an n-step nonhomogeneous line compensate the poles of the input
impedance of the homogeneous lines and thus prevent resonances at multiple
frequencies corresponding to those poles. The method is demonstrated in the
design of filters with short-circuit loops. The corresponding expression for
the input impedance is evaluated according to the Richards procedure for
calculation of wave impedances. A typical triple-resonance Chebyshev filter
with quarter-wavelength couplings and short-circuit loops was built and then
tested, the results indicating a cutoff frequency ratio $\omega_{max}/\omega_{min}=5.03$ with
a minimum attenuation of 32 dB throughout the band and an almost infinite
suppression of the first parasitic harmonic at frequency $3\omega_0$. Figures 2;
references 6: 4 Russian, 2 Western (both in Russian translation).
[310-2415]

ADAPTIVE SYNCHRONOUS ACCUMULATION SYSTEM FOR QUASI-PERIODIC SIGNALS

KITAYEV, V. B., MAL'TSEV, A. A. and SERGEYEV, Ye. I., Gorkiy State
University

[Abstract] An adaptive synchronous accumulation system is proposed for
filtering a quasi-periodic signal from a mixture containing additive noise.
The system incorporates a section which makes a nonlinear quasi-optimum

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estimate of the unknown period (phase) of the valid signal, plus a signal
estimation section consisting of a classical synchronous accumulation
circuit. The route mean square signal filtering error is analyzed theoreti-
cally. The vertical estimates of the effectiveness of the system are con-
firmed by experiments employing an analog-digital synchronous accumulation
system. The authors express their thanks to A. N. Malakhov for attention
to the work and S. Ye. Sergeyev for assistance in preparation of the experiment.
Figures 4; references: 6 Russian.
[33-6900]

COMMUNICATIONS

TOLERANCE SYNTHESIS OF MULTILAYER RADOME WALLS

LERMAN, L.B., SKURSKIY, P. P. and SHUMILO, T.V.

[Abstract] The design of plane multilayer radome walls for a receiver of electromagnetic waves within a given wavelength range Λ and a given incidence sector Θ is considered from the standpoint of unitary construction and quantity production. Because analytical methods of tolerancing are not practical for multi-layer structures, a method of tolerance synthesis is proposed which uses the transmission coefficient for radio waves as the critical performance parameter. The method is applied to an N-layer wall and a linearly polarized wave of length incident at angle θ. After the characteristic impedance matrix for such a wall with lossy layers has been defined, the problem is formulated as one of finding the region of $D \subset R^{3N}$ of layer thicknesses d_1, d_2 such that $|T|^2 = F(x_1, x_2, \ldots, x_{3N}, \theta, \lambda) \geq F_{min}$, $x_i \subset D_i$ when $\forall \theta \subset \Theta$ and $\forall \lambda \subset \Lambda$, where $x_1, x_2, \ldots, x_{3N}$ are design parameters of the wall layers and $F(\theta, \lambda)$ is the power transmission coefficient for electromagnetic waves (a smooth function of incidence angle and wavelength). Calculation of the rectangular tolerance field in the $d_2/\lambda - d_1/\lambda$ plane involves expansion of the F function into a Taylor series about $\Delta x_i = x_i - x_i^0$ and numerical differentiation of the linear terms, with all nonlinear terms disregarded in the first approximation. The algorithm was used for the design of a symmetric triple-layer wall with dielectric permittivities $\varepsilon_1 = \varepsilon_3 = 3.1$ and $\varepsilon_2 = 1.256$, loss tangents $\tan\delta_1 = \tan\delta_3 = 0.007$ and $\tan\delta_2 = 0.004$, and layer thicknesses $d_1/\lambda = d_3/\lambda = 0.0313$ and $d_2/\lambda = 0.264$ required to have $F_{min} \geq 0.95$ for $\lambda = $ const and $0 \leq \theta \leq 50°$. The solution to this problem is a set of many rectangles containing the point x_0, and selection of the appropriate one among them requires an additional criterion such as some technological constraint. Figures 2; references 4: 3 Russian, 1 Western.
[310-2415]

TOWARD TECHNICAL RENEWAL OF PRODUCTION

ZUBAREV, O. B., USSR Deputy Minister of Communications

[Abstract] Soviet needs for scientific and technical progress include
advances in communications that can be achieved in part by developing a
unified automated communications network for the entire country. The present
article reports on some of the aims to be accomplished by such a network.
It would provide each family with a telephone, improve the quality of music
broadcasting (including total stereophonic programming) and give two nationwide
TV programs and several additional local programs in major cities. The system
of satellite communications, now conducted via the Soviet satellites "Orbita",
"Moskva" and "Ekran" and the international satellite "Intersputnik", would
be expanded. Telephone systems in republics now lagging in this type of
communications, such as Georgia, Armenia, and the Tajik and Turkmen SSRs,
would be greatly expanded. Modern telegraph equipment, already being intro-
duced in the Baltic states and in cities such as Novosibirsk, Kiev,
Khabarovsk and Leningrad, would be extended to other parts of the country.
Automation would also be extended to the postal system, which currently re-
quires enormous amounts of labor. Some republics are lagging in this
modernization program, such as the Tajik and Azerbaijanian communications
ministries and some others. The latest information and properly trained per-
sonnel are also necessary in order to achieve communications objectives.
[5-12131]

AUTOMATION OF RADIO RELAY LINE OPERATING SYSTEMS

RAKOV, A. I., docent, Kuybyshev Electrical Engineering Communications
Institute, PANKRATOV, Ye. D., docent and GUK, N. I., deputy chief,
"TTsUMS-3" [expansion unknown]

[Abstract] The necessity for converting intermediate radio relay stations
into fully automated ones has long been realized, but no criteria or exact
procedures for such modernization have been developed. Meanwhile, personnel
at such stations have only 0.1% of their time occupied in actual work, at
significant expense. Calculations of idle time for the Soviet radio relay
system show the great waste of human resources involved in antiquated opera-
tions. The causes of radio relay breakdown, which are 28% equipment failure,
35% power failure and 10% human error, are such that they could be accep-
table if a repairman were within 0.63 hours from a given automated station,
and this is the recommendation of the authors for determining automation of
a particular station. Tables 2.
[5-12131]

ELECTRONIC IMPULSE DEVICE FOR POSTAL-TELEGRAPH SUBSTATIONS

KRASKOVSKIY, Ye. G., foreman, Voroshilovgrad Telephone-Telegraph Station

[Abstract] The author describes the automated billing relays at the station that have replaced earlier billing devices, which required the constant presence of qualified personnel. The portable unit figures day and night tariffs automatically, at a rate of 25 impulses per minute. Four different electronic panels are diagrammed and described. There is a back-up billing system in case the primary system goes down for any reason. Quenching circuit resistors and bypass diodes improve the reliability of the electronic system, which has not been out of operation since its installation and revision (in 1981 and 1983, respectively). Figures 4.
[5-12131]

QUALITY STANDARDS FOR LOCAL TELEPHONE SYSTEMS

VASIL'YEV, V. F., chief, Moscow Municipal Telephone System and KAMENKOVICH, V. Z., chief economist

[Abstract] Quality has special meaning to communication specialists, because the direct link between use and technology in telephones puts special demands on high fidelity production. The authors describe the comprehensive quality control system introduced in Moscow in 1977 and perfected the following year. Statistics are kept on telephone repairs, excess out-of-service time compared with published standards for restoration of service, and complaints attributable to enterprise failure per 1,000 telephones. An incentive program for directors of telephone system divisions has been instituted with both positive premiums for outstanding services and penalties (at twice the premium rate) for shortcomings in service. Pay telephones receive special attention in the quality control program. Service quality parameters were instituted for automatic telephone services on 1 July 1984, and such standards are being developed for the remaining telephone system operations not yet covered.
[5-12131]

TM OUP K-60P REMOTE CONTROL SYSTEM AS MEANS FOR AUTOMATING TECHNICAL
MAINTENANCE OF TRANSMISSION LINE

BORISOV, B. P., MURATOV, L. I. and SHNAYDERMAN, M. G.

[Abstract] The TM OUP K-60P remote control system for attended repeaters,
which is in series production to replace the STM-1 OUP remote automation rack,
is described. The TM system (like the STM-1) services two transmission
routes within the 4.32-6 KHz band, each of which can incorporate as many as
7 unattended repeaters. The 0.3-4 KHz spectrum is used for a service communi-
cations channel. Notification signals--normal, urgent and routine--are used
to test and localize malfunctions in cables and unattended repeater contain-
ers. The block diagram of the TM-OUP K-60P is traced and analyzed. This
system can be used to automate the testing and localization of malfunctions
in composite parts of transmission lines (cables, protective structures and
line circuits) carrying line circuits serving K-60P and V-60E transmission
systems. Figures 3.
[3-6508]

INFLUENCE OF DESTABILIZING FACTORS ON SIGNAL-TO-NOISE RATIO IN QUANTIZED
FEEDBACK REGENERATORS

VASIL'YEV, V. V. and GUREVICH, V. E.

[Abstract] A method is proposed for analyzing the influence of destabilizing
factors on quantized feedback regenerators. The method makes it possible to
estimate the degradation and the signal-to-noise ratio at the input to the
regenerator decision device which occurs because of deviation of the actual
amplitude-frequency characteristic of the correction amplifier, phase jitter
of the gating pulses and incomplete compensation by the quantized feedback
circuit of low frequency distortions in the digital signals. The findings can
be used in developing and designing digital transmission system line circuits.
Figures 5; references 3: 1 Russian, 2 Western.
[3-6508]

ACCUMULATION OF QUANTIZATION DISTORTIONS IN REAL PULSE-CODE MODULATION

POLYAN, L. Ye. and NOVOSELOVA, M. V.

[Abstract] The influence of irregularity of the amplitude-frequency characteristic of pulse-code modulation channels on error propagation during repeated analog-digital and digital-analog conversions of voice grade channels is analyzed. It is assumed that the signal-to-distortion ratio is measured with a narrowband (e.g. sinusoidal) signal input to the channel, and that the distortion power is measured in the frequency band x_1/x_2. The formula derived for the signal-to-distortion ratio of a narrow-band signal is tested in a composite channel carried by IKM-30 transmission systems. The theoretical and experimental figures agree to within 0.2 dB. It is found that a composite channel having the same number of component pulse-modulation channels but with different amplitude-frequency characteristics will have differing signal-to-distortion ratios. Figures 4; tables 1; references: 2 Russian, 1 Western in Russian translation.
[3-6508]

CONSTRUCTION PRINCIPLES OF INTEROFFICE CONNECTIONS IN ANALOG-DIGITAL MUNICIPAL TELEPHONE NETWORKS

METEL'SKIY, G. B., PSHENICHNIKOV, A. P. and SOLODOV, P. P.

[Abstract] Two promising ways are proposed for implementing digital switching systems in municipal telephone networks: the establishment of individual digital regions within existing networks, or the creation of a "superimposed" digital telephone network. It is concluded that trunk groups from analog automatic exchanges to electronic exchanges must be connected to an electronic incoming message node in existing municipal networks employing incoming message nodes, or both incoming and outgoing message nodes. The analog-digital conversion equipment must generally be remoted to the outgoing analog exchange (in networks employing incoming messages) or to the outgoing message node serving the analog millions numbering group (in networks employing outgoing and incoming message nodes). A superimposed digital network employing no more than one node in the trunk between electronic exchanges is feasible in existing analog networks handling from 500,000 to 3 million numbers. When setting up communications between electronic exchanges in a superimposed digital network using trunk groups

carrying multiples of 30 channels, it is best to use alternate routes when the traffic intensity reaches a level at which the group capacity in the outward direction exceeds 30 channels. Figures 7; references 6: 4 Russian, 2 Western.
[3-6508]

EVOLUTION OF AUTOMATIC TELEPHONE INTEROFFICE INTERACTION SYSTEMS

MISULOVINA, Ye. L.

[Abstract] Methods are presented for setting up an interaction between existing and new automatic exchanges in telephone networks. Alternative methods for interaction between automatic exchanges over different types of trunks are tabulated. The use of common-channel signalling and common control channels is explained. It is found that it is more economical for like exchanges to interact than for exchanges employing different systems (step-by-step, crossbar, electronic or quasielectronic). Future integrated digital networks will employ centralized control within the network, using stored-program exchanges and digital transmission systems. Figures 1; tables 2; references: 4 Russian.
[3-6508]

APPROACH TO TECHNICALLY AND ECONOMICALLY OPTIMUM RADIO RELAY COMMUNICATIONS LINE CONSTRUCTION

DARINSKIY, Yu. V., KALUZHSKIY, V. M., LARIN, V. Ye., MIKHAYLOV, E. A. and TISHCHENKO, M. P.

[Abstract] This study solves the problem of radio relay line optimization in terms of the coefficient of absolute effectiveness of primary production fund utilization $K_{ab}=P/F$, where F is the cost of the primary production fund and P is the profit. Using this criterion for radio relay line optimization, along with basic funds and operating costs, also makes it possible to allow for the free-form production volume index, i.e., to reflect the various items of production created by radio relay television and telephone trunks. The coefficients of absolute effectiveness of utilization of primary production funds characterizes the increased useful effect in relation to the

aggregate products consumed. The mathematical problem of finding optimum radio relay line parameters consists procedurally of maximizing the subject effectiveness criterion with respect to a set of optimized parameters which vary in the multidimensional domain defined by a system of restrictions and by the restrictions on the performance parameters of the line. The use of the approach is demonstrated by a numerical example. The method makes it possible to set up a data base of optimum parameters and cost structures for the construction and operation of certain standard radio relay lines. Figure 1; tables 3; references: 9 Russian, 1 Western in Russian translation. [3-6508]

AUTOMATIC TEST EQUIPMENT FOR INTEROFFICE SECTIONS OF RITM SWITCHED TELEGRAPH NETWORKS

DVORSKIY, E. E., TARNOPOL'SKIY, I. L., YELISEYEVA, M. Ya., YEGOROV, V. I., PARIKOZHKA, I. A. and BALANOVSKIY, L. I.

[Abstract] Equipment, designated RITM (expansion unknown), for automatic testing of interoffice sections in switched telegraph-type networks is described. The equipment, which was developed by the Kiev branch of the TsNIIS (Central Scientific-Research Institute for Communications) together with the Odessa branch of the TsKB (Central Design Bureau), periodically tests sections of a telegraph network in terms of specified evaluation criteria and automatically blocks malfunctioning sections while outputting information to the telegraph network control system. Two versions of the equipment are being produced: type I can test up to 500 sections connected to any type of switched exchanges, and type II, which contains additional test and blocking modules, can test up to 1000 sectors connected to Nikola Tesla exchanges. The test programs and recording of test results are described. The structural diagram of the system is traced and analyzed. The flow chart of the operating algorithm is presented. Figures 3; references: 3 Russian. [3-6508]

ESTIMATION OF PROBABILITY-TIME PARAMETERS OF CONNECTION ESTABLISHMENT
PROCESS IN TELEGRAPH NETWORK

FEDOTOVA, L. V. and FEDOTOV, V. Ya.

[Abstract] The probability-time parameters of the random process of
connection establishment is analyzed by means of a mathematical model con-
sisting of a probability-time graph based on the connection establishment
algorithm employed in the network. Using the graph, and knowing the generation
functions of individual transitions and transition time intervals, it is pos-
sible to define the resultant generating function for the transition from any
state to any other state by means of an arbitrary number of intermediate
nodes of the graph. It is found that entering the called party's number via
the telegraph keyboard, rather than using a separate push button dial, proves
the probability-time parameters of the connection process and speeds it up.
It is concluded that the universal use of keyboard dialing can reduce
connection time, thus improving channel capacity utilization and making it
possible to use the same error protection methods for dialed numbers as for
data. Figures 3; references: 7 Russian.
[3-6508]

DISCUSSION OF PROBLEMS OF LOCAL TELEPHONE NETWORK DEVELOPMENT

MONINA, G. Ye.

[Abstract] This articles provides a review of papers presented to the All-
Union Conference for the Exchange of Experience in the Expansion and Tech-
nical Operation of Municipal and Rural Telephone Networks held in Riga in
December 1983. Issues which remain to be dealt with include increasing the
number capacity of local telephone networks, increasing the production of
cable for multichannel systems and providing telephone service for populated
areas with fewer than 50 residents. The use of single-channel and low-
capacity radio relay lines is suggested for the latter. The prospects for
development and organization of municipal and rural telephone network opera-
tion are discussed. The effect of shortages of material and labor on the
introduction of new automatic exchanges is outlined. The need for expanding
internal plant and dispatcher telephone communications is emphasized. The
implementation of V-2-2, KNK-12, VO-12-Ye, IKM-15, ZONA-15 and RADAN-2
equipment, although available, is being delayed in some republics. Numerous
telephone installation orders have gone unfilled in various areas. In
addition to line structures and in-plant equipment, major emphasis is placed
on personal training and improving the qualifications of maintenance personnel.
[3-6508]

COMPONENTS, HYBRIDS & MANUFACTURING TECHNOLOGY

FREQUENCY CONVERTERS ON A BASIS OF A ASYMMETRICAL PIEZOSTRUCTURE

BELYAYEV, V. V., DANOV, G. A., KOROLEV, A.T., FROLOV, V.N. and SPIRIN, Yu.L., Moscow Institute of Radio Engineering, Electronics and Automation

[Abstract] A piezoceramic voltage converter in the form of a monolithic T-plate with the two segments orthogonally polarized has been found also to convert the frequency. When a sinusoidal voltage of an amplitude higher than some threshold level is applied to the input electrodes on the excitation side, a voltage of a subharmonic or other fractional frequency appears at the output electrodes on the generating side. Frequency conversion will occur only when the two segments are acoustically mismatched, a sufficiently large mismatch being attainable with a generator segment much narrower than the exciter segment. Experimental data indicate that such a frequency conversion is a parametric process. Frequency converters built with TsTBS-4 or TsTBS-7 piezoceramics have also excellent voltage transformation characteristics, the voltage ratio reaching as high as 20. Their performance as voltage generators stabilizes very effectively at cryogenic temperatures, with no phase transition occurring at temperatures near the boiling point of nitrogen. Such devices are useful for energy conversion as well as for data processing. Figures 3; references: 2 Russian.
[312-2415]

ARC EROSION OF METAL IN CURRENT INTERVAL OF 1-10 AMPERES

PRAVOVEROV, NIKOLAY LEONIDOVICH, doctor of technical sciences, and STRUCHKOV, ALEKSANDR IVANOVICH, engineer

[Abstract] The present article reports on mathematical planning of an experiment intended to show the dependency of arc erosion of Cu, Ni, Fe, Pd, Ag and

W on the current in a range of 1-10 amperes, with charge duration of 3-10 ms. The information was sought as an aid in selecting contact materials for low-voltage commutation equipment for telephone relays. Tests were made using fixed contacts and input charge ranging from 1 to 10 amp, while current amplitude was 1-25 amp with 10% permitted error. Erosion was measured by weighing the contacts after the tests. While erosion was dependent on cathode current for Ag and Pd, the situation was more complex for Cu, Ni, Fe, Nb and W, and in some cases anodes used in these tests began to disintegrate. Further comparisons were made between Ag and Cu, Pd and Ni, Pd and Fe, and W and Nb; the thermal nature of anode arc erosion was also examined. Here results showed that an oxide formed on the anode which broke down with rapid heating unless the melting point of the metal and the point of oxide disintegration were close together or coincided. At 5 amps, Al, Y and Zr eroded chiefly at the anode, while others eroded chiefly at the cathode and there were some intermediate metals. Aluminum, ittrium and zirconium formed heat-resistant oxides with high electrical resistance. Tables 2; references: 9 Russian.
[7-12131]

COMPUTERS

ART OF PROGRAMMING PROGRAMMABLE MICROCALCULATORS, PART 12: SOLUTION OF DIFFERENTIAL EQUATIONS

TROKHIMENKO, Ya.K. and LYUBICH, F. D.

[Abstract] Programmable microcalculators can be programmed to solve first-order ordinary differential equations for initial conditions $x_0, y_0 = y(x_0)$ by various Runge-Kutta methods of numerical integration after conversion into corresponding difference equations. Program 1/34 solves the equation $y' = f(x,y)$ by the modified Euler method. Program 2/34 solves the equation $y' = f(x,y)$ by the refined Euler-Cauchy method. Program 3/34 solves the equation $y' = f(x,y)$ by the third-order Runge-Kutta method. Program 4/34 solves the equation $y' = f(x,y)$ by the fourth-order Runge-Kutta method. Program 5/34 solves the equation $y' = f(x,y)$ by the first-order Adams method. Program 6/34 solves the equation $y' = f(x,y)$ by the second-order Adams method. Program 7/34 solves the equation $y' = f(x,y)$ for given values of x and maximum error on a step, with automatic step selection and correction. Program 8/34 solves systems of up to six simple equations by the modified Euler method in YaMK34 input language. Program 9/34 solves the system of equations $y' = f(x,y,z)$ and $z' = g(x,y,z)$ by the fourth-order Runge-Kutta method. All these methods of solution belong in the Runge-Kutta class. In addition, there are two programs available for solving ordinary differential equations of higher than first order: program 10/34 which solves a fourth-order differential equation by the composite second-order method and program 11/34 which solves the second-order differential equation $y'' = f(x,y,y')$ by the fourth-order Runge-Kutta method. Tables 1; references 4: 3 Russian, 1 Western (in Russian translation).
[310-2415]

ELECTRICAL INSULATION

DIAGNOSIS OF INSULATION DEFECTS IN 1000+ V DISTRIBUTION NETWORKS WITH
INSULATED NEUTRAL

KUTIN, V.M., candidate of technical sciences, and KOBYLYANSKIY, A.V.,
engineer, Vinnitsa Polytechnical Institute

[Abstract] Statistical data on insulation faults occurring over a period of
one year in 6-10 kV distribution networks indicate that breakdown of
insulators is the most frequent cause and wire breaks are the close second,
while phase-to-phase flashover, discharger breakdown, and tie breaks are less
frequent. As the trend toward higher voltages continues, 6-35 kV networks
now usually have an insulated neutral. There are no data available, however,
on the dynamics of phase-to-ground insulation resistance during operation.
The present simple method of continuous insulation checking by measurement
of the neutral-to-ground bias voltage is not sufficiently reliable and accurate
in the case of shorts through high contact resistances. A refinement of this
method is therefore proposed which will make it effective not only during such
shorts through finite resistances but also during symmetric drops of insula-
tion resistance. The gist of the new arrangement is connecting an external
source of rectified voltage with a precharged shunting capacitor to the net-
work and monitoring the discharge transient which follows a short circuit to
ground or a dip of the insulation resistance. Then, either an indicator sig-
nal is generated, or the protective relaying system is selectively triggered.
The equipment includes a transformer with two secondaries (110/12 V) and two
diode rectifier bridges: one for superposing a 140 V d.c. voltage on the a.c.
network voltage and for charging the electrolytic capacitor, and one for
energizing an electronic relay which consists of a transistor, a thyristor,
and mechanical contactors. The device is connected across the neutral under
zero-current conditions in the network. The design of this device is based
on conventional circuit analysis taking into account leakage paths, and on
calculations of transient currents taking into account the response charac-
teristics of the equipment components. The device must, in turn, be inspected
periodically. Its performance characteristics are: range of resistance
measurement 0.5-100 kohm, response to symmetric resistance drop 1-30 kohm,
regulation of protective relay setting 0-20 kohm, power drain 50 W max, con-
tactors normally closed. Figures 4; references: 2 Russian.
[50-2415]

DYNAMICS OHM RESISTANCE CHANGES IN INSULATION OF ENDS OF MINE FLEXIBLE CABLES
FOR 660 AND 1140 VOLTS

KHALIMOV, VLADIMIR VLADIMIROVICH, senior teacher, Kommunarsk Mining-Metallur-
gical Institute, and SHCHUTSKIY, VITALIY IVANOVICH, doctor of technical
sciences, professor, Moscow Mining Institute

[Abstract] An important safety measure in using insulated-neutral cables
is to maintain ohm resistance at a level which will prevent dangerous situa-
tions and avoid shutdowns. The present article reports on a study of 16, 25,
35 and 50mm^2 flexible cables for mining in order to determine the ohm resistance
of ends and to evaluate its effect on overall ohm resistance of the electric
system in a mine. Simultaneous study was made of 660 and 1140 V cables in
the same climatic circumstances, with the addition of dust in order to approxi-
mate real working conditions. Calculations based on the data obtained were
placed on graphs, which indicated that with increasing test periods and the
accumulation of dust, both test cables (at the two voltages) lost ohm resis-
tance in the insulation. Subsequent tests showed that ohm resistance was
retained in the cable segments with proper relay operations and function even
when heated, so that the electrical system did not lose its safety protection.
Even when temperatures reached 70-80°C, there was no justification for close-
down for safety reasons. However, planners should take into account the
ohm resistance changes observed in the study. Figures 3; references: 4
Russian.
[7-12131]

METHOD OF OPERATIONAL ENHANCEMENT OF ELECTRIC STABILITY OF CABLE INSULATION

KHABIBULIN, V. M., chief, SSKTB [expansion unknown] sector, USSR Ministry of
Communications

[Abstract] Communications cables frequently suffer losses in electric stabili-
ty that are discovered only after considerable delays. The present article
suggests low-pressure gas buffers to replace air in such cables, thus in-
creasing cable stability. The gasses suggested are electrically negative
fluorine-containing substances with properties of chemical inertness and
slow decomposition, and absence of vaporization at the temperatures and
pressures to which communication cables are subjected. The most promising,
freon-12 (CCl_2F_2) and freon-22 (CCL_3F), are already frequently used to find
leaks in such cables. Experimental results showed that either gas, in a
freon-air mixture, brought improved stability. Freon-12 was the best in this

regard, but it liquified at -29.8°C. Although use of these gasses requires care with open flame and "cold" repair methods, improved reliability justifies the use of gas insulation in electric communication cables. Figures 1; tables 2.
[5-12131]

DETERMINATION OF MOMENTS OF INITIAL ESTIMATE DURING LINEAR APPROXIMATION
OF DISTRIBUTION OF EJECTED IMPURITY

AMIRKHANOV, A. V., KAZINOV, V. A. and FAYZRAKHMANOV, V. R.

[Abstract] Because the real distribution or profile of an impurity implanted
in a semiconductor target is usually not a normal one, it becomes necessary to
include higher-order moments for a more accurate description of experimental
data. Known other distributions (Edgeworth series or Pearson curves) and
theories (J.B. Sanders or K. Winterbon) are not adequate, the most accurate
appearing to be approximation of experimental data with an analytical
curve $f(x, \mu_i[j],\ldots, \mu_n[j])$ by the method of least squares ($\mu_i,\ldots, u_n$ -
moments of distribution. $j= \overline{0.k}$ - consecutive number of iteration). The
initial approximation $\mu_1[0],\ldots, u_n[0])$ of moments is indeterminate, however,
as long as the impurity concentration at the target surface remains above zero
with a "tail" of the distribution curve in the $x \leq 0$ region. In the case of
low-energy implantation, for example, the distribution of impurity ejected by
the target and backscattered is unknown. Because the choice of initial
approximation influences only the convergence and not the accuracy of the
approximation procedure, any convenient one can be selected and a linear
one $f_1(x)= ax+ b$ for the region $x \leq 0$ is found to be most expedient. Three
higher central moments (2nd, 3rd, 4th) of the distribution in the $x<0$ region
have been calculated as functions of the ratio of surface concentration
to maximum concentration. A comparison with corresponding moments based on
a power-law initial approximation $f_1(x)= a/(x-b)^{2n}$ ($n= 1,2,3,4$) and on an
exponential initial approximation $f_1(x)= ae^{bx}$ or $f_1(x)=ae-(x-b)^2$ indicates
for what distributions and within what ranges the linear approximation is
the optimum one. A practical application of this procedure to typical
phosphorus and boron implantations in silicon reveals that the linear initial
approximation is acceptable for nearly normal distributions with higher
than zero concentration at the surface and an attendant "tail" in the
$x < 0$ region. Figures 4; references 9: 1 Russian, 8 Western (1 in Russian
translation).
[312-2415]

PARAMETER ESTIMATION FOR RECEIVER OPERATING AS PHOTON COUNTER

BYCHKOV, S. I., RUMYANTSEV, K.Ye. and FIRSOV, V. S.

[Abstract] The feasibility of using slow photomultipliers for photon recording and counting is examined on the basis of statistical simulation of the photodetection process. The parameters of a photoreiver suitable for this purpose are those on which its mean pulse response characteristic depends. These are estimated here for a photomultiplier consisting of Q identical stages and a photon flux with a Poisson distribution, assuming no fluctuation of one-electron pulses and a photocathode response time not longer than the duration of a strobing pulse. The requirements for a photon counter are established on the basis of signal distribution density histograms and passband-resolution characteristics as well as the integral signal distribution function, the latter being approximated closer by a gamma distribution than by a Poisson distribution. Figures 2; references: 2 Russian.
[310-2415]

OSCILLATION OF ABSORPTION COEFFICIENT DURING HEATING OF CHARGE CARRIERS IN InSb BY INCIDENT MICROWAVE RADIATION

IVANCHENKO, V. A., KLIMOV, B. N. and LYUBIMOV, I.N.

[Abstract] Resonance and oscillation of properties occurring during skin-effect heating of high-mobility semiconductors such as n-InSb by incident electromagnetic microwave radiation are analyzed, taking into account absorption and reflection. The theoretical relations have been verified experimentally. Single crystals of InSb with an electron concentration n= $5.6 \cdot 10^{13}$ cm^{-3} and an electron mobility $\mu= 3.6 \cdot 10^{6}$ cm^2/(V$\cdot$s) at 77 K were placed inside a waveguide at 77 K and there exposed to radiation at the 8.3 mm wavelength (35.16 GHz). The results of measurements indicate that as the electric field intensity is increased, the absorption coefficient oscillates toward a higher level while the reflection coefficient oscillates toward a lower level. Oscillation of both coefficients is attributable to geometrical resonance at the boundary between the skin layer and bulk region of the semiconductor during heating of charge carriers. Figures 1; references 5: 4 Russian, 1 Western.
[310-2415]

DEPENDENCE OF BREAKDOWN VOLTAGE FOR P-N JUNCTION ON PARAMETERS OF ION IMPLAN-
TATION AND SEMICONDUCTOR HEAT TREATMENT

MAKARETS, N. V., ROZANOVA, M.A., FAL'KO, G.L. and FEDORCHENKO, A.M., Kiev
State University

[Abstract] Avalanche breakdown of a p-n junction after ion implantation and
subsequent impurity redistribution by diffusion during heat treatment of the
semiconductor is analyzed, considering that the breakdown voltage becomes
higher as the geometrical curvature of the junction surface decreases. The
postdiffusion impurity concentration is calculated first, from the proba-
bility $P(x,y,z)dxdydz$ of an ion arriving at and remaining in the infinitesimal-
ly small region $dxdydz$ around point (x,y,z), assuming implantation with a
monoenergetic ion beam and including the Euler error integral in the result.
The corresponding equation of the transient process is solved with the use
of Green's function and for a temperature-dependent diffusion coefficient.
The breakdown voltage is a function of the energy gap and of the ratio
$(r_{min}/w)^n$ $(1 \leq n \leq 2)$ of minimum radius of curvature of the junction surface to
width of the depletion layer at breakdown, with $n = 1$ for a cylindrical junction
surface and $n = 2$ for a spherical one. Further calculations yield the
dependence of the breakdown voltage on the implantation dose, on the diffusion
distance, and on the impurity concentration in the substrate. Numerical data
pertaining to a silicon structure doped with boron through windows of various
sizes and shapes in the mask indicate that annealing should raise the ava-
lanche breakdown voltage appreciably in the case of sufficiently long diffu-
sion distances. Figures 4; references 5: 2 Russian, 3 Western.
[312-2415]

DETERMINATION OF PARAMETERS OF DOPED THIN SEMICONDUCTOR LAYERS FROM PLASMATIC
MINIMUM OF REFLECTION COEFFICIENT FOR INFRARED RADIATION

DENISOVA, N.A., KRUZE, T.A., REZVOV, A.V. and TETEL'BAUM, D.I., Gorkiy State
University

[Abstract] The concept of an equivalent homogeneous layer is introduced
in order to determine the parameters of depthwise nonuniformly doped thin
semiconductor layers by the reflection method of infrared spectroscopy. The
effective layer thickness and the effective concentration of free charge
carriers can be determined, independently of the effective charge carrier
mobility, from the plasmatic minimum reflection coefficient and the charge

carrier frequency at which it occurs. This is possible because both parameters of the plasmatic reflection dip depend uniquely on those two parameters of a doped semiconductor layer. The relations are established here in approximate analytical form for frequencies above the plasma frequency of free charge carriers in free spaces, assuming negligible absorption in the layer and correspondingly a real rather than complex dielectric permittivity. These relations in normalized form, taking into account the dielectric permittivity of the substrate material and including the dissipation parameter, have been applied to silicon layers doped by ion implantation and by diffusion, respectively, for numerical data and correlation with experimental results. Figures 4; tables 1; references 7: 5 Russian, 2 Western (1 in Russian translation).
[312-2415]

LOWERING TEMPERATURE OF SINGLE-CRYSTAL SILICON FILM FORMATION BY IRRADIATION OF SUBSTRATE SURFACE WITH LIGHT PULSE

ZYBTSEV, S.G. and SHEFTAL', R.N., Institute of Radio Engineering and Electronics, USSR Academy of Sciences

[Abstract] Single-crystal silicon films were deposited on Si, Ge, and GaAs substrates with steady heating of the latter in a resistance furnace. The silicon target, 40 mm away from the substrate surface, was vaporized by giant radiation pulses of 0.15 J energy from a ruby laser (0.694 μm wavelength) or a CO_2-laser (1.06 μm wavelength) at repetition rates of 0.1-1 Hz, with the dose of silicon vapor fed per pulse controlled within 7%. The lower limit of the temperature range within which single-crystal films form without irradiation of the substrate is 700°C. Additional heating by radiation pulses from the ruby laser lowered this limit further to 600°C, while amorphous silicon layers formed on the nonirradiated surface segments. An experiment performed with a pulse laser and necessary optics (prism, mirror, lens, filters) for determining the mechanism at work revealed only that the substrate, after having been additionally heated, cools down much faster than expected and silicon vapor condenses on a surface colder than expected. The cause of this lowering of the film formation temperature for single crystals is not yet known. Figures 2; references: 1 Western.
[312-2415]

OPTIMUM ESTIMATION OF PHASE DISTORTIONS IN SOME ADAPTIVE OPTICS PROBLEMS

ALEKSEYEV, S. I. and CHEREMISOV, A.K.

[Abstract] An algorithm is synthesized for recovering the random two-dimensional function of the phase distortions of the optical signal at the entrance pupil of a telescope from measurements of its partial derivatives, by maximizing the a posteriori probability density in order to obtain images of distant objects which are not distorted by atmospheric turbulence. A quasi-optimum estimate is shown in order to represent the smoothed maximum likelihood estimate. A solution of the Neumann problem for the Poisson equation is found in general form. References 11: 6 Russian (1 concerned with foreign radio electronics), 5 Western.
[6-6900]

THERMOELECTRON EMISSION FROM InGaAsP PHOTOCATHODES WITH NEGATIVE ELECTRON AFFINITY

TURCHINSKIY, V. M., MUSATOV, A. L., NAUMOV, A. V. and TAROPIN, V. I.

[Abstract] Thermoelectron emission from InGaAsP photocathodes with negative electron affinity is investigated for temperatures ranging from -40 to +25°C. The thermoemission currents were measured in photoelectronic multipliers with InGaAsP photocathodes based on epitaxial films of $In_{0.88}Ga_{0.12}As_{0.24}P_{0.76}$ doped with zinc. The thermoelectron emission dark current is found to drop exponentially as the temperature; the thermoemission current at room temperature is comparatively high, equalling approximately $5 \cdot 10^{-12}$ A; however, this figure drops to approximately 10^{-14} when the photocathode is at working temperature (-20°C). The trap concentration in the surface region and the concentration of surface states appear to be a strong function of the manner in which the photocathodes are prepared; it is proposed that the use of optimum preparation modes can reduce the amount of thermoelectron emission for InGaAsP photocathodes in the same way as for Si photocathodes with negative electron affinity. Figures 1; references 4: 2 Russian, 2 Western.
[6-6900]

MODELLING OF SWITCHING PROCESSES DURING TURN-OFF OF SEMICONDUCTOR POWER
RECTIFIERS

DONSKOY, A.V., doctor of technical sciences, SMORODINOV, V.V., candidate
of technical sciences, STARUNOV, B.M., candidate of technical sciences,
Leningrad Order of Lenin Polytechnical Institute imeni M.I. Kalinin

[Abstract] An approximate mathematical model is proposed for simulating
turn-off of semiconductor power rectifiers and analysis of attendant
switching processes in the associated electric circuit. A single diode-
thyristor rectifier or several in series are considered, their dynamic
performance being characterized by two parameters: reverse-current overshoot
amplitude and recovery charge as functions of forward current and of rate
of current drop (di/dt). The algorithm of calculating these relations, on
the basis of an approximate equivalent circuit, makes use of tabulated data
and linear interpolation. The parameters of the model are evaluated on the
basis of experimental data on lifetime of charge carriers and time constants
of switching transients. Typical numerical results are shown for VCh-160-7-
10 high-freuqency diodes in an inverter operating under 500 V. Figures 3;
references 5: 4 Russian, 1 East German.
[315-2415]

PERFORATION FILM FOR MICROCHANNEL PLATE

DYATCHENKO, A. A., KOLENKO, Ye. A., MASLENKOV, I. P., ROZE, Yu. A. and
SMIRNOV, B. N., Leningrad Institute of Precision Mechanics and Optics

[Abstract] The use of a so-called "perforation" film on the input surface
of a microchannel plate in order to protect the cathode against bombardment
by positive ions and to prevent optical feedback from the glowing screen is
described. The optimum film thickness is found on the basis of experimental
data on the interaction of the primary electron beam with the plate. A
method is described for applying the perforation film to the input of the
plate. The paper is recommended by the Physics Department (Kafedra).
Figures 2; tables 1; references 6: 3 Russian, 3 Western.
[36-6900]

TOTAL SIGNAL SUPPRESSION MODE IN TRAVELING-WAVE TUBE OPERATING NEAR BOUNDARY
OF PASSBAND

KUZNETSOV, A. P. and KUZNETSOV, S. P., Saratov State University

[Abstract] The possibility of realizing several types of suppression modes
in a TWT operating near the boundary of the passband of the delay system is
demonstrated. The total suppression mode is useful for parameter measurement,
because it is determined exclusively by interaction between the beam and the
field, and is independent of the energy output and input matching conditions.
The suppression mode has no analog in single-wave theory, and corresponds to
zero combined energy flux in the input section of the device. Figures 3;
references: 3 Russian.
[33-6900]

FORMATION OF ION FLUX IN MULTIAPERTURE ION SURFACE

DANILOVICH, N. I., Minsk Radio Engineering Institute

[Abstract] The use of an oscillating-electron multiaperture ion source to
produce a flow of Ar^+ ions 100 mm in diameter for ion-beam etching of large-
scale integrated circuits is examined. An ion source with an axial magnetic
field and an ion-optical system incorporating two grids is investigated and
found to produce a converging ion flow with increased density along the axis
of the source. The maximum ion current density and ion energy are found to
depend upon the potentials on the grids of the ion-optical system. The maxi-
mum value of the ion current in the flow, and the current density distribution,
can be adjusted over a wide range by changing the potentials on the screen and
accelerating grids. This permits potential control of the focusing and of the
basic technological parameters of the ion flow with the help of microprocessor
controllers. The author expresses appreciation to Professor of the University
of the State of Minnesota (USA), G.K. Vener, for assistance in conducting
the experiment. Figures 6; references: 7 Western (1 reference concerned with
foreign electronic technics - in Russian).
[33-6900]

SHAFT SPEED SENSOR FOR CONTACTLESS HIGH PRECISION DIRECT CURRENT ELECTRIC DRIVES

POZHIDAYEV, V. M., OMEL'CHENKO, V. V. and SHUPRUTA, V. V.

[Abstract] A shaft speed sensor is proposed for an electric drive employing a four-section contactless dc motor. Formulas are derived for the optimum sensor parameters and for the amount of output voltage pulsations. It is found that minimum voltage pulsations at the sensor output can be achieved by selecting the relationship between the values of the resistors in the circuits of the rectifier diodes. The voltage drop across the rectifier diodes increases the pulsations in the voltage at the sensor output, especially at low speed. The optimum relationship between the values of the resistors in the diode circuits at low speeds depends strongly upon the voltage drop across the diodes, and less upon the speed of revolution. Figures 3; references: 3 Russian,
[32-6900]

NEW TRENDS IN SILENT CONTROLLED ELECTRIC DRIVES FOR FERROUS METALLURGY

SLEZHANOVSKIY, O. V., doctor of technical sciences, DATSKOVSKIY, L.Kh., candidate of technical sciences, ITENBERG, B.Z., candidate of technical sciences, KUZNETSOV, I.S., engineer, and BOGUSLAVSKIY, I.Z., candidate of technical sciences

[Abstract] Synchronous motors with frequency conversion instead of speed reducing gears combine low inertia with silent operation without sacrifice in overload capacity, these being the most desirable features of electric drives for metal processing and forming under dynamic loads. The two basic methods of frequency control have constant flux linkages in the stator and constant magnetic flux in the air gap. In the first case the internal power factor of the motor remains near unity throughout the load and speed range, but a heavy overload will cause saturation of the iron so that the motor torque ceases to be proportional to the stator current. In the second case the power factor varies with load and speed, especially in the generator mode of operation, but this method is preferable under highly dynamic conditions and the only one feasible when transients following fast regular changes or external perturbations must be normalized with limited available exciter boosting voltage. The current trend in the development and design of gearless synchronous motor drives is minimization of the rotor inertia and electric loading of the field winding, optimizing and automating the frequency control by whichever method appropriate for given applications, and fully utilizing the motor and cyclo-converter capacity in order to ensure maximum economy. This is particularly difficult in the case of two speed regulation ranges, above and below nominal speed, respectively, in which case the control system must be flexible with a structure adaptable to either of the two control modes. Either compensated or uncompensated synchronous motors are used for such gearless drives, depending on the particular application: cycling, torquiing, pulsing, reversing, etc. Figures 3; references 6: 5 Russian, 1 Western. [315-2415]

ANALYSIS OF STABILITY OF PARAMETRIC CONTROL SYSTEM EMPLOYING ELEKTRODYNAMIC
VIBRATION GENERATOR

BOZHKO, ALEKSANDR YEVGEN'YEVICH, doctor of technical sciences, professor,
Kharkov Institute of Municipal Construction Engineers; and SHPACHUK, VLADIMIR
PETROVICH, junior research worker, UkrSSR Academy of Sciences Institute
of Machine Building Problems

[Abstract] Electrodynamic vibration generators used to produce determinant,
polyharmonic and chance vibrations for testing equipment are widely used.
The present article presents a system for analyzing the stability of the
parametric control system, based on linearization of the expression for the
output signal envelope of the vibration stand. The linearization takes the
cophasal and quadrature components into consideration. Calculations are used
to show the role of stand dynamics in the stability and accuracy of the control
system. Vibration transmission tends to compress the band of frequencies in
the parameters being tested, so that the "outer extremes" of the vibration
band must be reconstructed during any analysis of polyharmonic and chance
vibrations. Figures 4; references: 13 Russian.
[7-12131]

INVESTIGATION OF SEMIAUTOMATIC AIRCRAFT CONTROL PROCESSES EMPLOYING TIME
REDUNDANCY IN ON-BOARD DIGITAL TRAJECTORY CONTROL COMPUTERS

FEDOROV, S. M., SUKHIKH, N. N. and SMUROV, M. Yu., Academy of Civil Aviation

[Abstract] Aircraft control processes during the malfunction and subsequent
recovery of on-board control computers employing time redundancy is investi-
gated. The acceptable computer recovery time is estimated. The method is
simulated by means of an analog-digital piloted complex with real pilots in
the control loop. The acceptable computer recovery time is estimated by
comparing the values of the required criterion which are obtained during con-
trol of the aircraft without recovery of the malfunctioning computer, and
with recovery after different elapsed times. The numerical estimates of the
acceptable recovery time can serve as recommendations for the developers of
digital flight control systems, as well as civil aviation flight personnel.
The paper is recommended by the Department (Kafedra) of Aviation Instruments
and Automatic Systems. Figures 3; references: 5 Russian.
[32-6900]

SYNTHESIS OF STEP WEIGHT FUNCTIONS IN FREQUENCY DOMAIN FOR MEASURING INTEGRAL CHARACTERISTICS OF SIGNALS

PERSHENKOV, P.P., CHUVYKIN, B. V. and SHAKHOV, E. K., Penza Polytechnical Institute

[Abstract] A method is presented for synthesizing weight functions belonging to the class of step weights with uniform digitization step and integer values. This class is employed because the weight functions it contains are the easiest and simplest to realize with a structure consisting of an integrating analog-digital computer and a digital filter which implements a weighted addition algorithm. An example of the weight function synthesis method is presented. The characteristics of the weight function synthesized are close to those of optimal continuous weight functions. The paper is recommended by the Department (Kafedra) of Information-Measuring Techniques. Figures 4; references: 5 Russian.
[36-6900]

LINEAR-QUADRATIC APPROXIMATION OF ACCURACY PROBABILITY CHARACTERISTICS OF NONLINEAR OPTICO-MECHANICAL SYSTEMS

DEGTYAREV, V.G., ZVEREVA, T.L., PETROV, V.P. and SHISHKOVSKIY, S.Yu., Leningrad Institute of Precision Mechanics and Optics

[Abstract] Linearization of distribution functions of random quantities with known probability distribution is more universally applicable and in many cases more effective than other methods such as Gram-Charlier series, Edgeworth series, or Pearson curves. This applies particularly to probability characteristics which are nonlinear functions of normally distributed random

variables, as in the case of mechanical components of optical instruments. Approximation by Taylor series expansion is considered and the error of retaining only up to second-order terms is estimated for a typical device, namely a cam mechanism. The relative error is found to be extremely small, the probability distribution having a negligible skew but a significant kurtosis. Article was recommended by Department of Higher Mathematics. Figures 1; references 5: 4 Russian, 1 Western (in Russian translation).
[313-2415]

METHODS OF REDUCING INTERACTION OF CHANNELS IN SUPERCONDUCTING THREE-COMPONENT MAGNETOMETER

LISITSYN, V.A., MOTORIN, S.V. and ROGACHEVSKIY, B.M., Novosibirsk Institute of Electrical Engineering

[Abstract] Interaction of channels lowers the accuracy of magnetometers for simultaneous pointwise measurement of several components of magnetic induction and its gradients, a superconducting instrument being particularly suitable for this purpose. This problem exists also in such a magnetometer with three mutually orthogonal pickup loops across the secondaries of transformer-type flux transducers for measuring the three Cartesian space components of a magnetic field vector. The coupling between any two of these loops is evaluated in terms of mutual inductance, assuming almost perfectly shielded secondary transformer coils, whereupon the resulting interference signal is calculated. The theoretical relations and the results of numerical analysis indicate a way to reduce the interference signal, namely replacement of a single pickup loop in each channel with two identical ones connected in series aiding. Experiments have confirmed the feasibility of designing and packaging the loops so that they will reduce the interference to a very small fraction of a percent without occupying more space than the compact version of single loops. Article was recommended by Department of Information and Measurement Engineering. Figures 3; tables 2; references 4: 3 Russian, 1 Western (in Russian translation).
[313-2415]

TROUBLE IN SQUID-MAGNETOMETER

POLUSHKIN, V.N., Tomsk Polytechnic Institute

[Abstract] The performance of a magnetometer consisting of a SQUID with preamplifier and synchronous detector, and with an integrator as inertia element in the control loop, is evaluated from the standpoint of trouble immunity. With the use of transfer functions and retention of only their first terms for simplicity, two kinds of troubles are analyzed here: one caused by vibration or external interference and one caused by internal noise. Maximizing the bandwidth of the instrument so as to avoid trouble of the first kind will also lower the immunity to trouble of the second kind. It is necessary, therefore, to also minimize the interval of measuring time in the wide-band mode by manipulation of the time constant in the control loop. The time constant should be large during interference-free measurement and small to forestall noisiness. The technique is demonstrated on a magnetometer which measures a slowly varying useful signal in the presence of pulse interference capable of pulling the instrument out of synchronism. Article recommended by Department of Radio Engineering. Figures 5; references 5: 2 Russian, 3 Western (all in Russian translation). [313-2415]

MEASURING THRESHOLD LUMINOUS FLUX FOR CRYOGENICALLY COOLED PHOTOELECTRIC CIRCUIT

MIKHEYENKO, L.A., Kiev Polytechnic Institute

[Abstract] A method has been developed for experimentally determining the threshold luminous flux and thus the sensitivity of photoelectric circuits with photodiodes at temperatures as low as 77 K. A light-emitting diode with input from a noise generator serves as excitation source for the tested photo-diode. The photodiode output signal, after preamplification and amplification, is measured twice with a voltmeter at the output of the tuned amplifier. First the voltmeter measures the rms noise voltage of the photodiode with the noise generator turned off and with the photodiode output connected directly to the preamplifier. Then, with the noise generator turned on and the photodiode output connected to the preamplifier through a 3 dB attenuator, the current of the light-emitting diode is set to the level which corresponds to the same photodiode output voltage as before. With a linear light-emitting diode, luminous flux proportional to excitation current, the voltage reading at the

noise generator is proportional to the threshold flux for the photodiode at
the frequency of the output amplifier. A comparative evaluation of experi-
mental data on the basis of theoretical relations for noise voltage and power
indicates that silicon devices have a lower threshold than germanium devices.
In the diode the threshold luminous flux decreases monotonically with in-
creasing load resistance, first fast over the 2-70 kohm range and then only
slightly above 100 kohm. In the galvanic mode there is an optimum load
resistance, within the 20-50 kohm range, which corresponds to the minimum
but higher than zero threshold luminous flux. There is a maximum ratio of
input resistance to load resistance, within the 2-3 range, beyond which the
threshold luminous flux will not decrease much further but the frequency
characteristics will deteriorate. Silicon photodiodes always perform better
in the galvanic mode, germanium photodiodes only at low levels of background
noise. Article was recommended by Department of Optical Devices. Figures 2;
references: 6 Russian.
[313-2415]

OPTOELECTRONIC DEVICE FOR READOUT OF GRAPHIC DATA

GURCHIN, I.I. and SAVEL'YEV, M.V., Novocherkassk Polytechnic   Institute

[Abstract] An optoelectronic device for discrete readout of graphic data
has been developed which does not require kilovolt pulses and open bare
electrodes. Two photoreceivers at two corners of the tablet rotate about
their axes in the plane of the tablet, from a stationary light source at the
center of the common tablet edge between them toward another light source
located on the pointer moving over the tablet. Each photoreceiver consists
of two opaque coaxial cylinders, the inner one wrapped around a photocell
on the axis, both with a slit at a common radius for passing light from the
pointer to the photocell. The angle of vision can be narrowed and the accur-
acy improved by use of diaphragms or replacement of the photocells with
triangular prisms. The electronic part includes a pulse generator, a data
availability control unit, a data processing channel for each photoreceiver
(trigger in "1" or "0" state - AND gate - counter - AND gate, all pairwise
interconnected), and a computing unit which calculates rectangular coordin-
ates from angle readings, with interface and multiplexer channel to a YeS
Unified System computer. The latter operates with floating decimal and
produces 12-digit numbers: 4 digits for characteristics, 4 digits for
mantissas, and 2 bits, respectively, for the signs of each. The computer
hardware includes a read-only memory, a shift register, two characteristic
registers, two mantissa registers, an adder for characteristics, an adder for
mantissas, a register for storing intermediate results, and a register for
storing final results. The computer software contains programs for analyzing
changes of coordinate points and appropriate correction. The count rate is

0.000048 rad/pulse, in either continuous or start-stop readout. Article was recommended by Department of Computers. Figures 2; references: 6 Russian.
[313-2415]

DIGITAL THERMOMETER WITH LINEARIZER ON SLIDE WIRE

BELOUSOV, I.A., SACHENKO, A.A. and KOCHAN, V.V., Ternopol Institute of Finance Economics

[Abstract] Means of linearizing the measurement characteristics of primary instrument transducers have been developed for temperature recorders, in which case an auxiliary transducer in the form of a linearizing slide wire is added to the thermoelectric transducer with an $F(t)=kt+\Delta(t)$ characteristic (t-temperature, $\Delta(t) \ll kt$) and an arithmetic unit is added for calculating $E=F(t)-\Delta(t)$. The thermocouple loop contains a d.c. voltage supply with the (-) terminal on the junction side, a low-level analog-to-digital converter, and a slide wire. An automatic potentiometer is connected across the thermocouple loop, between junction and slide wire on one side and behind the (+) terminal of the voltage supply on the other. The potentiometer circuit includes the additional slide wire, which reproduces the $\Delta(t)$ relation, whose moving contactor is kinematically linked to that of the main slide wire and a separate voltage supply with limiting resistor. The thermocouple signal passes through a commutator switch with very low parasitic thermo-emf and through compensators to a d.c. amplifier with a digital voltmeter across the output. The voltage reading is added to the bias voltage and to the linearizer output voltage, whereupon the sum is amplified. The amplified sum signal is on the one hand sent to the automatic potentiometer with the linearizing slide wire and on the other hand encoded by an analog-to-digital converter for storage. Compensators include one for the temperature of free leads, one for errors caused by manufacturing variance, and one for drift of the calibration characteristic in time during heating to high temperatures. For further reduction of the nonlinearity error and improvement of the temperature recording accuracy, the temperature range is subdivided and a decoder is provided for identifying the given temperature interval while blocking the control signal for all other intervals. The 2-channel instrument built according to these principles covers the 700-1300°C temperature range with a 0.1°C resolution and a ± 1°C error not counting the thermocouple instability. Article was recommended by Department of Computer Processing of Economic Data. Figures 3; tables 2; references: 7 Russian.
[313-2415]

ENSURING REQUIRED METROLOGICAL RELIABILITY OF ANALOG INSTRUMENT CHANNELS BY
PARAMETRIC COMPENSATION

DOLIDZE, R.V. and MOSTOVOY, I.V., Leningrad Institute of Electrical Engineer-
ing imeni V.I. Ul'yanov (Lenin)

[Abstract] The method of parametric compensation is proposed for ensuring
the required reliability of analog instrument channels in aggregate measure-
ment and information systems, considering that aggregation with analog
channels is limited by the finite number of available standard functional
components. Synthesis of such an aggregate for a reliability not lower than
required t_r, with probability P_s, is equivalent to solution of the correspond-
ing inequality with lower bound $P\{t_m(N,S_i) - t_r \geq 0\} \geq P_s$ under appropriate
constraints. Here $t_m(N,S_i)$ is the reliability determined by the metrological
characteristics of N functional components in the system and S_i is the
mathematical expectation of changes in the i-th metrological characteristics
caused by aging. According to the results of experimental studies of the aging
process, the vector of assembly parameters can be represented by statistical
models $\tilde{\xi}(t) = \xi_0 + A(\xi_0)t^{\beta(\xi_0)} + \dot{\xi}(t)$ for passive elements as well as diodes
and transistors and $\xi(t) = \xi_0 + \dot{\xi}(t)$ for integrated circuits (ξ_0 $\xi(t=0)$,
$\xi(t)$- stationary ergodic random process with zero mathematical expectation
and truncated normal distribution between t-sections, $A(\xi_0)$ and $\beta(\xi_0)$ -
semirandom functions). The iterative algorithm of parametric compensation
and synthesis through solution of that inequality with lower bound has been
programmed in FORTRAN-4 for a vector of continuous assembly parameters and
with proximity of the "aging" model to the "mathematical expectation of
changes" model as optimality criterion. First the vector of assembly para-
meters is varied and then, if necessary, the mathematical expectation of
changes. The method was successfully applied to an automatic control and
regulation system with an analog instrument channel containing 16 functional
components, using a comparator consisting of one integrated circuit, 3
transistors, 7 diodes, 5 capacitors, and 20 resistors as compensator.
Article was recommended by Department of Information and Measurement Engineer-
ing. Figures 1; references 6: Russian.
[313-2415]

MODELING DEVICE FOR INVESTIGATING ELECTROMAGNETIC PROCESSES IN ASYNCHRONOUS MACHINES

PARVANYAN, L. S., engineer

[Abstract] A structural-modeling device is proposed which can be used to investigate the processes in asynchronous machines with allowance for saturation and the actual core configuration by using the geometric parameters, winding arrangement and properties of the magnetic materials employed. The block diagram of a modeling device is prepresented which incorporates interconnected models of the magnetic circuit of the rotor and stator, with the first connected to the model of a short-circuited rotor winding and the second connected to a model of the stator winding through a rotation simulator. A setup for modeling the resistances of a short-circuited rotor winding is also presented. The device can be employed for teaching purposes in order to test treatments adopted in designing asynchronous machines. Figures 3; references: 4 Russian.
[23-6508]

CORRECTION OF INFLUENCE OF LOST EVENTS ON TIME SPECTRUM SHAPE IN MULTICHANNEL ANALYZERS

APANASOVICH, V. V. and NOVIKOV, Ye. V., Belorussian State University imeni V. I. Lenin

[Abstract] Algorithms are investigated for correcting distortions in the time spectrum shape caused by individual lost events in the recorded streams. Two methods are presented for eliminating bias in recovering the stream intensity. The structural diagram of an analyzer which implements the proposed recording algorithms is presented. The proposed process is simulated by computer in order to analyze the effectiveness with which the shape of the time spectrum is reconstructed. The simulation results indicate that the mode employing additional correction is more effective and provides error which is 10-15% smaller than that of the rejection mode. The paper is recommended by the Department (Kafedra) of Electronic Mathematical Machines. Figures 2; references: 3 Russian.
[32-6900]

MAGNETICS

CONTROLLABLE FERRITE FILTER WITH MAGNETIC MEMORY

ZHITNYUK, V.S., MELKOV, G.A., SOLOV'YEV, D. A. and TSYMBAL, A.P.

[Abstract] According to the relations between the magnetic field intensity and the magnetodynamic-resonance frequency of a ferrite filter, controlling that frequency requires the production of nonzero magnetization. This can be achieved by means of a constant external magnetic field, through a closed magnetic circuit with a negligible demagnetization factor. In the case of a spherical ferrite core it is most expedient to drill a diametral through-hole for a wire carrying a current pulse. The inherent memory built into such a device will, after cessation of the current pulse, maintain a residual azimuthal magnetization in the plane perpendicular to the wire and the current flow. A band-elmination filter was built on the basis of this principle, with a sphere 2.2 mm in diameter made of Mark ISCh-4 polycrystalline ferrite material and held in a retainer made of polystyrene foam. A wire 0.06 mm in diameter was passed through the 0.2 mm in diameter diametral hole. This filter was inserted into a standard rectangular waveguide for the 8 mm waveband, with the wire perpendicular to the wide walls of the waveguide. The dependence of the filter resonance frequency on the amplitude of the control current in a pulse of 10 µs duration indicates an 80 MHz wide passband, with 20 dB loss at resonance frequency and with parasitic elimination bands approximately 2 GHz above the center frequency of the elimination band. Figures 2; references: 2 Russian.
[310-2415]

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USING GRAPHS TO CODE INFORMATION IN HIGH-DENSITY DIGITAL MAGNETIC RECORDING

OBOLIKSHTO, B. S. and ROZORINOV, G. N., Kiev Polytechnical Institute

[Abstract] This is a report on a method for coding automatic recorders that is designed to permit reduction of the total amount of required electronic equipment and to minimize interfrequential symbolic effects in high-density digital magnetic recording. The heart of the system is a directed graph of binomial 0 - 1 bits corresponding to the following bit of information. After proposing the theoretical foundations for the system, an experimental graph is suggested with three arcs from each peak, which select marker and non-marker arcs and exclude discharges and resultant arcs. Although the resulting graph was regarded to be useful, preliminary compensation could not be determined without further improvements to the system. The system can also be used for decoding, where the previously read binomial code will determine the direction of transition. Figures 5; references: 1 Russian.
[20-12131]

ALGORITHM FOR CALCULATING STABILIZING FORCES OF ELECTROMAGNETIC SUPPORT

NIKITENKO, ALEKSANDR GRIGOR'YEVICH, Candidate of technical sciences, dotsent, Novocherkassk Polytechnical Institute; PALIY, VLADIMIR YKOVLEVICH, candidate of technical sciences, dotsent, Novocherkassk Polytechnical Institute; LOBOV, BORIS ·NIKOLAYEVICH, candidate of technical sciences, dotsent, Novocherkassk Polytechnical Institute; GRINCHENKOV, VALERIY PETROVICH, candidate of technical sciences, dotsent, Novocherkassk Polytechnical Institute; MATSUPIN, GENRIKH PAVLOVICH, senior teacher, Novocherkassk Polytechnical Institute, and DUBOV, VASILIY VASIL'YEVICH, candidate of technical sciences, head of section (otdekm) VELNII (expansion unknown)

[Abstract] Electromagnetic supports are used in many applications with automatic control devices, as supports for numerous devices and apparatuses. Their stabilizing effect is based on the tendency to return to their original position if the design is correct. The present article reports on calculations of the attracting force for such electromagnetic supports. The algorithm, which has 13 expressions, was programmed into a digital computer and has become a basic component in automated design of electromagnetic supports. The stabilizing forces generated are dependent on the amount displacement from the anchor and the geometry of both anchor and support. Figures 4; references: 1 Russian.
[7-12131]

CYLINDRICAL-MAGNETIC-DOMAIN DEVICE BUILT WITH 'TAPIR' ELEMENTS AND QUASI-PLANAR STRUCTURE OF LAYERS

IL'YASHENKO, Ye.I., PARINOV, Ye.P., MATVEYEV, S.N. and CHIRKIN, G. K., Institute of Control Problems, USSR Academy of Sciences

[Abstract] The technology of cylindrical-magnetic-domain devices for mass production is analyzed from the standpoint of stability with respect to design and manufacturing variances. Devices controllable by an external magnetic field are considered specifically, with structures consisting of dielectric and metal-film layers. The design parameters subject to variation are the thickness of layers, the electrophysical properties of the materials, and the magnetic field and current flow geometry. Accordingly, the two main problems are the shape optimization of magnetic control components and the current-conducting control components, respectively. A new approach is proposed for the solution of these problems. Elements with piecewise rectilinear, or piecewise curvilinear, or composite piecewise rectilinear and piecewise curvilinear contours, called "tapir" figures are formed for domain coupling and driving or magnetic functional components so as to ensure a sufficiently wide range of stable operation. Isolating channels of minimum width are formed by removal of metal so as to ensure minimum impedance of, and maximum heat dissipation from, the remaining metal conductors. Several devices such as registers, data storages, switches, and nucleation generators have been designed and built according to these principles, using Permalloy, yttrium-iron garnet, or samarium as the magnetic domain, and aluminum as the current conducting material. Figures 8; references 13: 6 Russian, 7 Western. [312-2415]

RADIATION OF STATIONARY MAGNETIC FIELD SOURCES IN MEDIA WITH FLUCTUATING MAGNETIC PERMEABILITY

DAVYDOV, V. A., Moscow State University

[Abstract] The radiation of stationary magnetic field sources is examined as the magnetic permeability of the medium μ changes instanteously from μ_1 to μ_2. Three cases are studied: radiation of an infinite rectilinear conductor carrying current; radiation of a long 2-conductor line; and radiation of a magnetic dipole. It is found that, in contrast to stationary electrical field sources, stationary magnetic field sources require neither a change in

directions nor a change in the magnetic properties of the medium along the directions for radiation to occur: radiation occurs even when the time-varying magnetic permeability is a scalar. The authors thanks B. M. Bolotovsk for helpful discussion of the results of the work. References 5: 4 Russian, 1 Western.
[33-6900]

USE OF BASE SURFACE METHOD TO CALCULATE MAGNETIC FIELDS OF COMPLEX SOURCES

LAVROV, VALENTIN, YAKOVLEVICH, candidate of technical sciences, Assistant Professor (Docent), Leningrad Institute of Aviation Instrument Manufacture; and PETROV, SVYATOSLAV IVANOVICH, graduate student, Leningrad Institute of Aviation Instrument Manufacture

[Abstract] A general model is constructed for calculating the resultant magnetic fields employing the base surface method for the general case of a set of complex sources in an eddy-free region of space. An expression is derived for the absolute value of the complex amplitude of the scalar magnetic potential of the kth temporal harmonic in each region of space by solving a Laplace equation in spherical coordinates. The integration constants are found by investigating the space-time structure of the magnetic field on the base surface experimentally. By using this approach it is possible to pose and solve various problems relating to the compatibility of the electromagnetic elements, devices and systems, and to compute the fields and characteristics of complex multi-stage electromechanical systems. References: 3 Russian, 1 Western in Russian translation.
[42-6900]

INVESTIGATION OF SUPERCONDUCTING ELECTROMAGNETIC BEARINGS

MILOSHENKO, VLADIMIR YEVDOKIMOVICH, candidate of Physico-Mathematical Sciences, Assistant Professor (Dotsent), VORONEZHSK Polytechnical Institute; and KARMAZIN, V. M.

[Abstract] Superconducting bearings designed for maximum lift are investigated under static and dynamic conditions. A bearing consisting of an excitation winding and a platform made of technical niobium was tested on a bench incorporating a low-temperature section and an instrumentation

section. It was found that rotation of the electromagnetic shield (platform) did not degrade the design parameters of the bearing; a load on the bearing exceeding the normal design value by a factor of 1.5 had no significant influence on the behavior of the bearing. Rotation of the bearing at rates exceeding 1000 rpm was found to degrade somewhat the load characteristics of the bearing. Figures 8; references 17: 16 Russian, 1 Western (in Russian translation).
[42-6900]

PROBLEM OF A FIELD IN SPACE SHIELDED BY A STRUCTURE OF CLOSED RODS AND SEGMENTS

TITKO, ALEKSEY IVANOVICH, candidate of technical sciences, senior scientific research worker, Electrodynamics Institute, Academy of Sciences, UkrSSR, Kiev

[Abstract] The method of distributed current loops, which is based on electrical circuit theory and electromagnetic field theory, is employed to analyze the characteristics of the external electromagnetic field of cylindrical windings which carry pulsating current and are shielded by complex structures consisting of highly conductive axial rods arranged in a circle and shorted at the ends. In the method employed, the eddy currents distributed on the boundary surfaces of the conducting elements are represented by a system of current loops which are discrete in one direction and distributed in the other. If the distributions of the currents are known, they are assigned exactly or approximately by elementary functions. The currents are assigned discretely in the directions in which the distributions are unknown. This produces a system of closed distributed current loops which form an electrical circuit. The shielding field provided by two segmented rods is analyzed as an example. Figures 3; references: 5 Russian.
[42-6900]

LINEAR WIDEBAND MICROWAVE AMPLIFIERS FOR MONOLITHIC INTEGRATED MICROCIRCUITS

KUSHNIRENKO, A.I. and PETROV, G. V.

[Abstract] The main problem in designing monolithic integrated analog devices with GaAs field-effect transistors, especially microwave amplifiers with bandwidths ranging from tens of megahertz to several gigahertz, is the rational layout of passive matching circuits on the semiconductor chip. One way to decrease the required chip size for such an amplifier is to use field-effect transistors with a Schottky gate, the next step being to match appropriately common-gate and common-drain stages or common-drain and common-source stages. The matching circuit is based on the drain-to-source impedance of a transistor and the maximum attainable Q-factor of the effective inductance in the simplified equivalent circuit. The frequency characteristics of gain, bandwidth, and voltage standing-wave ratio have been calculated for such amplifiers, one with an emitter follower between the common-gate stage and common-drain stage, one with an emitter follower between the common-drain stage and common-source stage, and one, for comparison, with resistors equivalent to no matching between stages. Computer-aided design and performance calculations are applicable to these matching circuits with active devices. Figures 3; references 7: 2 Russian, 5 Western.
[310-2415]

REAL-TIME ANALYSIS OF SPACE CHARACTERISTICS OF MICROWAVE ELECTROMAGNETIC
PULSE FIELDS BY MEANS OF CONTROLLABLE LAYER STRUCTURES

DUDKIN, V.P. and OBTEMPERANSKIY, Yu.S.

[Abstract] A method is proposed for analyzing the space characteristics of
microwave electromagnetic fields, not only of continuous but also of pulsating
ones, which have been recorded sequentially by scanning. The gist of this
method is passive probing based on photoconduction in semiconductors and using
a local inhomogeneity with higher concentration of excess charge carriers.
Into such a device a structure is inserted which contains a semiconductor layer
and only weakly perturbs the analyzed field when not excited by the latter. In
general the dimensions of such a probe are fractions of the radiation wave-
length. The intensity of noise resulting from even the slightest mismatch
can exceed by far the intensity of the signal. Extracting the latter is the
principal problem, which can be solved by modulation of the probe and subse-
quent processing of the field signal at the modulation frequency. Major diffi-
culties here are the limited lifetime of excess charge carriers, shorter than
10^{-4} s in silicon, and the correspondingly weak photoexcitation effect.
Another problem is that processing of the field data coming from the probe
involves calculating the modulus of signals, which introduces an indeterminacy
during recording of amplitude-phase distributions. The basic device consists
of a receiver antenna behind a microwave power divider, followed by a square-
law detector feeding through an amplifier into a video monitor before an elec-
tronic scanner with a cathode-ray tube, the latter also facing the microwave
power divider. The monitor sweeps in synchronism with the scanner. This
device can be refined by adding another receiver antenna behind the microwave
power detector, with an identical square-law detector connected with the first
one into a subtracting circuit for the purpose of suppressing the noise com-
ponent of radiation. An experimental prototype was built which used a pyramidal
horn antenna for receiving the field signals reradiated by the probe and
a planar dielectric-semiconductor-metal structure as scanner screen, with a
circular aperture 100 mm in diameter and a resolution of at least 2 lines/mm.
It was successfully used for analyzing the interference pattern of two coherent
spherical waves, one coming from a standard microwave oscillator operating
either continuously or in pulses. Figures 3; references: 5 Russian (1 con-
cerned with foreign electronics).
[310-2415]

WIDEBAND STRIP-LINE MICROWAVE MULTIPLEXERS WITH DIRECTIONAL COUPLERS IN TANDEM

GORBACHEV, A.P., KUPRIYANOV, A.M. and NEVEROV, S.G.

[Abstract] The design and the performance of wideband strip-line microwave multiplexers which use cascades of quarter-wavelength multiloop directional couplers as traveling-wave filters are analyzed on the basis of their partitioned scattering matrix $S_{MP} = \begin{bmatrix} S_{II} & S_{I\ II} \\ S_{II\ I} & S_{II\ II} \end{bmatrix}$. Two of its elements are diagonal scattering matrices, S_{II} pertaining to the output arms of couplers under matched loads and $S_{II\ II}$ pertaining to the coupler arms with signal source and internal resistance as well as ballast resistors. The two other elements $S_{I\ II}$ and $S_{II\ I}$ are square matrices which characterize the relations between incident and reflected waves at the coupler output terminals and arms with resistances. An experimental 4-channel multiplexer was built with coupled and single shielded symmetric strip lines deposited on both sides of an FAF-4 film by the photochemical process. Measurements with panoramic instruments indicate that such a multiplexer can indeed form four frequency channels with the necessary $1.8 > x_m > 1.7$ overlap factor, with an input voltage standing-wave ratio not exceeding 1.5 and maximum dissipative power losses in either dielectric or metal not exceeding 1 dB. The minimum decoupling of channels was 21 dB. Figures 4; references 10: 7 Russian, 3 Western (1 in Russian translation).
[310-2415]

MICROSTRIP-LINE DIRECTIONAL COUPLERS WITH SMOOTHLY IRREGULAR COUPLING REGION

SHLEYE, V.R. and MIKHAL'CHENKO, V.I.

[Abstract] Synthesis of highly directional couplers using smoothly irregular coupled microstrip lines is proposed, as an alternative to using stepwise irregularly coupled microstrip lines with the inherent disadvantage of inhomogeneities at the critical locations. A directional coupler with both horizontal and vertical axes of symmetry is considered, for theoretical performance requirements based on ideal matching and ideal decoupling without losses. The design is treated as an optimization problem, namely finding the value of the vector of variables which will minimize the appropriate target function. The gap width is chosen as independent function of geometrical parameters, since it varies most appreciably as function of the longitudinal

coordinate, with the conductor width becoming the dependent function for which the solution is sought. The gap width is bounded bilaterally within the coupling region, the minimum width being determined by technological factors and the maximum width being determined by the tolerable size of inhomogeneity. The number of variable design parameters depends on the parametrization of the gap width function, one way being in the form of a power polynomial and another way being in accordance with interpolation rules. From the solution to the corresponding nonlinear equation for the wave impedance, one can calculate the frequency characteristics of performance parameters such as voltage standing-wave ratio, decoupling coefficient, and crosstalk attenuation. Numerical results have been obtained by this method for a directional coupler with copper conductors on a Polikor substrate. Figures 2; tables 1; references 11: 8 Russian, 3 Western.
[310-2415]

SCATTERING OF H_{10}-MODE WAVE IN RECTANGULAR WAVEGUIDE BY COUNTERPOSED DIAPHRAGMS WITH DIELECTRIC PLATE BETWEEN THEM

RAPOPORT, G.N. and SHEVCHENKO, L.V.

[Abstract] Scattering of an H_{10}-mode wave in a rectangular waveguide by a pair of counterposed diaphragms with a dielectric plate between them is analyzed, assuming negligible losses in the dielectric plate and in the waveguide walls. Both diaphragms are assumed to be infinitesimally thin and ideally conducting, as well as to have the same aperture c which is small relative to the distance 2d separating them. The problem is solved by the variational method, with the use of an equivalent fourpole network and with expansion of the transverse E,H field components into Fourier series in a complete orthonormalized system of vector eigenfunctions E_{mn}, H_{mn}. Synphasal and antiphasal excitations are considered for calculating the elements of the admittance matrix of that fourpole network. A numerical analysis reveals that, with the ratio of waveguide dimensions o /b fixed, the passband widens with widening of the relative diaphragm aperture c/d. While this is generally a vector problem with higher-order E_{in} as well as H_{in}, harmonics appearing when the permittivity of the dielectric plate is $\varepsilon > 1$, interaction of nonpropagating modes generated by the diaphragms must be taken into account when $\varepsilon = 1$ and the distance 2d is very small. Figures 3; references: 2 Russian.
[310-2415]

ALGORITHM FOR CALCULATING LINEAR PARAMETERS OF THREE-LAYER MICROSTRIP STRUC-
TURE

LABYNTSEV, ALEKSEY VIKTOROVICH, engineer Taganrogsk Radio Engineering
Institute, and KAZANDZHYAN, Khachik Ovanesovich, leading engineer,
Taganrogsk Radio Engineering Institute

[Abstract] One means of improving electrical and design parameters of ultra-
high frequency devices is to place strip conductors on both sides of a
dielectric base. The present article suggests a mathematical algorithm that
covers a wide range of strip devices and permits determination of the magni-
tude of linear parameters for shielded microstrip lines with three-layer
dielectric fillers and a random quantity of fine strip conductors positioned
on the margins of the dielectric foundation. The calculations are much more
accurate than those previously proposed, and require less machine time for
processing. Figures 1, tables 1, references: 4 Russian.
[7-12131]

BOUNDARY CONDITIONS FOR ELECTRODYNAMIC POTENTIALS AND ANALYSIS OF REGULAR
SHIELDED MICROSTRIP LINES

MUSHENKO, SERGEY VASIL'YEVICH, candidate of technical sciences, dotsent,
Taganrogsk Radio Engineering Institute

[Abstract] Previously the author developed integral equations for the sur-
face density of charges along and across currents on a strip conductor.
The present article offers a simpler method for calculating these values and
should therefore offer significant advantages. As a continuation of earlier
work, the equations presented are those in the earlier work (Cf. IZVESTIYA
VUZOV SSSR: ELEKTROMEKHANIKA No 10, 1983 opp 18-25). The 20 equations
shown in the present work give scale and vector electrodynamic potentials.
The author cites liberties taken in statements as a function of ambiguous
definition of certain of the potentials, caused in turn by section boundary
differences. The calculations presented here make such differences less
important. References: 2 Russian.
[7-12131]

FORMATION OF ASSIGNED DIRECTIVITY PATTERN BY USE OF QUASI-OPTICAL LENS

VOYTOVICH, N. N., KAZANTSEV, Yu. N. and TKACHUK, V. P.

[Abstract]   The possibility of creating the required directivity pattern in a microwave radiating system by selecting the appropriate amplitude and phase distributions of the functions R_n and T_n (coefficients of reflection and transmission). It is assumed that there are no heat losses in the reflectors, and that the phases of the functions R_n and T_n are independent. The findings can be used in part as estimates in synthesizing systems with various restrictions on the reflector parameters. The concepts and methods employed in synthesizing quasioptical lines which form an assigned field are employed in the statement of the synthesis problem and the development of the solution algorithm. A quasi-optical line segment is synthesized which consists of a series of slanting semitransparent reflectors which partially reflect the incident waves. Together, the beams reflected from all of the reflectors form a given directivity pattern. The complex variable parameters of each of the reflectors - the coefficients of reflection and transmission - which make it possible to form a given directivity pattern are found. A computer solution method is proposed. Numerical examples are presented in order to illustrate the method. Figures 3; references: 5 Russian.
[6-6900]

SIMPLIFIED UNSTEADY NONLINEAR EQUATIONS FOR TYPE-M BEAM DEVICES

ZAKHARCHENKO, Yu. F.

[Abstract] A system of unsteady nonlinear equations for type-M traveling wave tubes and backward wave tubes is examined which allows for space-charge forces and non-adiabatic beam movement. The system simplifies the solution of systems of equations in partial derivatives, and makes it much easier to calculate the space charge field. The wave method is used as the basis for an approximate unsteady theory which makes it possible to reduce the order of the system of nonlinear equations solved, and to reduce the integral equations for the space-charge fields to analytical equations. Calculation results are presented and compared with the results of calculations using the large-particle method. It is shown that the use of the approximately unsteady theory to investigate unsteady and steady state processes in type-M narrow-band beam devices provides results close to those obtained for the system of unsteady equations derived for type-M beam devices. Figures 3; references: 11 Russian.
[6-6900]

IMPROVEMENT OF ELECTROMECHANICAL SYSTEMS BY UTILIZATION OF MICROELECTRONIC TECHNOLOGY

BORTSOV, Yu.A., doctor of technical sciences, professor, Leningrad Order of Lenin Electrical Engineering Institute imeni V.I. Ul'yanov (Lenin)

[Abstract] The universal principles of constructing adaptive electromechanical servomechanisms are systematically formulated, with consideration given to possible causes of object instability and the characteristics of corresponding changes (continuous or stepwise, slow or fast, increment factor). The most common causes are changes in the servomechanism configuration, caused by geometrical distortion or inadvertent movement of parts, change in the apparent mass, transiency of visco-elastic couplings, change in object or control parameters under control action, and temperature changes or aging. Adaptive control with various types of analog or digital regulators (P, PI, PD, PID) is designed on the basis of equations describing the object, the appropriate reference model, and the regulator, respectively. The particular algorithm of control and the corresponding structure executing it depend on whether the object is rigid, elastic, or flexible, whether it is linear or nonlinear, and whether it is stationary or nonstationary. Inclusion of a microcomputer in the regulator loop constitute a significant advancement in the art of servomechanism construction and application. An outstanding example is a modally adaptive digital signal-type regulator for maintenance and regulation of motor speed under both internal and external perturbations in technological processes with participation of numerically program controlled machine tools or automatic manipulators and industrial robots. Figures 2; tables 2; references: 6 Russian.
[315-2415]

POWER ENGINEERING

TUNED TRANSFORMER FOR TESTING POWER GENERATORS

PURUSOV, A.A., engineer, Yarenergo (Yaroslavl Regional Administration of Power System Management)

[Abstract] Dry tuned transformers are now widely used in power systems for testing the insulation of air-cooled or hydrogen-cooled turbogenerators as well as of other large equipment, also for locating insulation faults on 6-10 kV power cables. Such a 6-10 kV -- 160 kVAR transformer with an open magnetic circuit has been developed by the Central Insulation and Overvoltage Protection Service of the Yaroslavl Regional Administration of Power System Management. It is designed for testing the insulation of 3-16 kV turbogenerators with power ratings up to 2000 MW, of large motors, and of cables. It has a 0-30 kV voltage regulation under a load current of at least 0.2-0.4 kA, with a ballast capacitor across the high-voltage secondary suppressing inductive currents in the low-voltage primary. The capacitance, nominally 0.001-0.0015 µF, can be increased up to 0.8 µF for a wide range of generators and motors. The low-voltage primary is designed for 220-380 V and consists of two coil groups. The high-voltage secondary is designed for 200 A or 11 A/mm^2 current density in the conductors, with its two coil groups connected either in parallel or in series. The transformer has been successfully used since 1976 in one electric power plant with TGV-200 turbogenerators and 6 kV motors. Extending the voltage range to 41 kV would require a secondary with 20,000 turns and a 750mm long iron core with 60-68 mm^2 cross-sectional area. Figures 3; tables 1.
[49-2415]

BUILDING PILOT THERMAL ELECTRIC POWER PLANT WITH AIR STORAGE FOR GAS TURBINES

Editorial Staff Report

[Abstract] The Scientific-Technical Council at Minergo (Ministry of Power and Electrification), USSR has reviewed and approved the work done at the Rostov department of the Atomic Thermoelectric Project on a pilot electric

power plant with air storage for its gas turbines. The operating cycle
of such a power plant includes compressing air during the load dip at night
and pumping it compressed into an underground reservoir, then feeding both air
and fuel (natural gas) from the reservoir into the combustion chambers of gas
turbines. The pilot plant is designed for 350 MW gas turbines and 120 MW
air compressors, with air pumped into the reservoir under a pressure of 6.6
MPa. The reservoir is to be buried in a bed of rock salt. Such a power plant
costs only 130-140 rubles/kW and covering load peaks for 5 h during the day
reduces the nominal fuel consumption rate to below 200 g/(kW.h). The pilot
plant is to be installed in the Belorussian SSR in an agreed upon location.
[48-2415]

WIDEBAND POWER DIVIDER

STECHENKO, V.I., TALALUYEV, A.V. and AKSARIN, L.A.

[Abstract] The design and the performance of power dividers using wideband
0.1-1000 MHz transformers are analyzed by the method of polyphase excitation
with rotating axis of symmetry. The voltage source is, accordingly,
represented as a superposition of nine sources in three groups of three.
Elements of the scattering matrix are calculated on the basis of the equiva-
lent circuits for symphasal and generalized antiphasal excitation, respec-
tively. The condition for matching is established in terms of output resis-
tance, frequency-dependent loss resistance, and balance resistance. The
results indicate a way to raise the upper cutoff frequency above the 100 MHz
of conventional power dividers to 1000 MHz, namely by resistance compensation
which makes it permissible to decrease the length of coils. Such a prototype
power divider was built with a supplementary 1: $\sqrt{3}$ autotransformer on the
input side and with all the power transformers wound on miniature two-window
cores of 200 VNP ferrite material, for operation in the 14-380 MHz frequency
range. Figures 2; references: 5 Russian.
[310-2415]

DETERMINING RESONANCE FREQUENCIES OF COMPONENTS OF ASYNCHRONOUS ELECTRIC MOTOR
DESIGNS WITH 50-63MM-HIGH AXIS DURING PROJECT PLANNING

ALIKHANYAN, KAREN ARTSVIKOVICH, candidate of technical sciences, senior
scientific research worker, director, NIIElektromash (Scientific-Research
Institute for Electrical Machines (Yerevan)

[Abstract] During designing of small asynchronous motors, as a rule no
calculations are made of their potential internal vibrations, thus making
it impossible to predict acoustical vibrations, durability and stability of
operation. This unconcern for product life was accepted at an earlier stage
of technological sophistication, but modern requirements and spreading use
of such motors require better planning. The present article offers the
results of mathematical and experimental study of internal vibrations and
other factors affecting motor wear and breakdown. The results provided suf-
ficient practical accuracy for motors with axes of rotation of 50, 56 and 63 mm;
the mathematical model has been programmed for the YeS-1022 computer. Figures
2; tables 1.
[7-12131]

CONTROLLED SHAPER OF MULTIPHASE SINUSOIDAL VOLTAGE

KROZ, ARKADIY GIRSHEVICH, candidate of technical sciences, dotsent Voronezh
Polytechnical Institute, and YUR'YEV VLADIMIR IGNAT'YEVICH, engineer;
Voronezh Polytechnical Institute

[Abstract] Various methods have been used in order to construct shapers con-
trolled by a digital-analog transformer, because such devices permit changes
of input frequency over a large range, allowing great stability. The com-
plexity of previous devices for this purpose can be avoided by using the fre-
quencies of support sinusoidal voltage and the regulated frequency of impulse
sequences. The present article describes a variant of this approach which
avoids the instability it has generally suffered in previous attempts. Cal-
culations are summarized for a test model, which used strobe methodology in
order to create a multi-phase sinusoidal voltage shaper combining great
accuracy and the speed of digital-analog operations with relative simplicity
and low cost. Input frequencies ranged from 0 to 100 Hertz. Figures 2;
references: 4 Russian.
[7-12131]

INCREASE IN USE OF ACTIVE MATERIALS IN ELECTRIC MACHINES WITH COMMUTATOR-LIKE CONFIGURATION OF PERMANENT MAGNETS

LOKHNIN, V.V., candidate of technical sciences, Moscow Automative Institute

[Abstract] A rotor with commutator-like configuration of permanent magnets is proposed for a rotating-field electric machine. Such a configuration is meant to improve the utilization of active materials. The material of the magnets is assumed to have a small ratio of resonance to coercive forces, $B_r H_c \leq 2 \leq \mu_0$ (μ_0 - magnetic permeability of vacuum), and the magnets are polarized circumferentially facing one another with like poles. A high flux density in the air gap is attained either by radial concentration with a large number of narrow magnets or by axial concentration with the rotor longer than the stator stack. The feasibility and the advantage of this configuration are demonstrated on the basis of relevant theoretical relations between rotor dimensions and the magnetic induction in the air gap. The magnets are aligned between and retained by two nonmagnetic sleeves, a polygonal inner one seating the magnets and a circular outer one. The sectoral spaces between the magnets with parallel sides are filled with laminations of magnetically soft material. Figures 3; references: 4 Russian.
[315-2415]

PROTECTION OF PERSONNEL OPERATING UNDER HIGH VOLTAGE ALONG 330-750 kV OVERHEAD TRANSMISSION LINES

STOLYAROV, M.D., engineer, and SMEKALOV, V.V., engineer, "PO Soyuztekehenergo"

[Abstract] Safety garments provide the most effective shield from hazardous electric fields, by forming an individual "Faraday cage" around a person and thus preventing flow of displacement or surge currents through the body during work along 330-750 kV overhead transmission lines. Such garments are made of special cloth, a composite of meshing cotton and conductor fibers. Inclusion of conductor fibers provides better protection, but also increases the cost of the garment and makes it less hygienic. The amount of conductor content is a tradeoff which must be optimized. Conductor fibers are either made of pure metal, usually copper often silver-coated, or of nonmetallic material mechanically carbonized ("Bikarbolon") or chemically metallized ("Elektron"). The disadvantages of metal fibers are heavy weight and easy fracture. Metallized fibers lose their protective capacity upon aging, down to 50% within one year. Experience in the Soviet Union as well as in the United States and in Japan indicates that carbonized fibers offer the best garment, with a life expectancy of five years. Cloth made of "Bikarbolon"

fibers which meets the minimum hygienic requirements is capable of shielding
a person from an electric field of up to 75 kV/m intensity and holding the
charge induced upon contact with objects at a "floating" potential at levels
not exceeding 0.2 µC, with the displacement current flowing through the body
not larger than 60 µA. The voltage between body and shield does not exceed
20 V. An experimental evaluation of garments with "Bikarbolon" fibers at the
Donbassenergo laboratories indicates that those produced in the Soviet Union
are the only fully adequate ones. Those produced in Hungary are usable for
work in cages only, those produced in East Germany and in the United States
do not meet the specifications. Figures 1.
[48-2415]

PRODUCT "STAND" THREE-PHASE LINE VOLTAGE STABILIZER AND DEVIATION SIMULATOR

LIPKOVSKIY, KONSTANTIN ALEKSANDROVICH, candidate of technical sciences,
deputy head of a department (Otdel), Electrodynamics Institute Academy of
Science, UkrSSR, Kiev; SIDORENKO, YURIY VASIL'YEVICH, junior research worker,
Electrodynamics Institute, Academy of Sciences, UkrSSR, Kiev; and FARBUN,
YURIY ALEKSEYEVICH, head of sector, SKTB (Speical Design and Technological
Bureau), Electrodymamics Institute, Academy of Sciences, UkrSSR, Kiev

[Abstract]   A three-phase high frequency alternating voltage stabilizer
and deviation simulator designated "STAND" is described. "STAND" was
developed at the Electrodynamics Institute, Academy of Sciences, UkrSSR.
The device, which is designed for laboratory adjustment and testing of
secondary power supplies, provides significant savings by improving labor pro-
ductivity and reducing power consumption. The "STAND" is a general purpose
device which can be employed to power any modules, racks or assemblies requir-
ing 127/227V ac power at 400 Hz.
[42-6900]

UDC: 621.3.313.17-82:621.398

RADIOTELEMETRY SYSTEM FOR HYDROGENERATOR DIAGNOSIS

BERBERYAN, G. V. and AKOPYAN, R. Ye., candidates of technical sciences,
and GRIGORYAN, S. N., ARAMYAN, A.L. and AKOPYAN, G. P., engineers

[Abstract] A contactless method is proposed for transmitting diagnostic
information from the rotor of a generator which improves the accuracy of the
transmitted signals. A radiotelemetry system is described which implements
the proposed method. The system works by transmitting measurement data from
the rotor to the stator of the hydrogenerator being tested. The output sig-
nals can be transferred from the receiver to a digital display, or can be

input to a computer, depending upon the further use of the information. The system consists of a transmitting section, which is affixed to the rotor, and a receiving section which is affixed to the stator. Loop antennas are employed for transmitting and receiving. Block diagrams of both sections are presented and explained. The results of the use of the system at the Krasnoyarsk Hydroelectric Plant is discussed. Figures 2; references: 4 Russian.
[23-6508]

USE OF TT-17P3, TT-5, TT-6 TONE-FREQUENCY TELEGRAPHY EQUIPMENT FOR ORGANI-
ZATION OF REMOTE-CONTROL CHANNELS IN POWER SYSTEMS

MEL'NICHENKO, F.G., engineer, Dneproenergo (Dnepropetrovsk Regional Adminis-
tration of Power System Management)

[Abstract] Telegraphic communication channels in the Dnepropetrovsk regional power system were organized in 1966 with MTTs-34 equipment. Among the deficiencies of remote control and telecommunication with this equipment is an insufficiently high data transmission rate, only up to 75 baud. This equipment is now to be replaced with TT-17P3, TT-5 and TT-6 tone-frequency equipment. Operation of this equipment in the relay-contact mode requires a few modifications: 1) Shunting the diode bridge as well the 11-12 contacts in the transmitter interlock system with a jumper; 2) Disconnecting terminal B1 in the input rack from ground; 3) Applying ±24 V from a battery or another voltage source to terminal B1 through a 910-1000 ohm - 2 W resistor and grounding the "+" terminal of that voltage supply; and 4) Connecting input of transmitter channel A1-B1 to connector sockets G35-G46 for facilitating performance tests. The transmitter will be frequency-modulated with a +60 V interlock voltage. The TT-17P3 equipment can operate in the bipolar mode with 2-4 V input voltage or in the unipolar mode with the interlock voltage, diode bridge and 11-12 contacts shunted in the latter case. Analogous modifications must be made in TT-5 and TT-6 equipment.
Figures 2.
[49-2415]

OUTLOOK FOR USE OF INFRA-RED IMAGERS IN ALUMINUM INDUSTRY

SERKIN, V.A., engineer, YAROSLAVTSEV, A.I., engineer, YAKOVLEVA, T.S., engineer, BEZDUSHNYY, Yu.N., engineer, SHNAYDER, V.V., engineer, and SHUL'ZHENKO, A.S., engineer, Scientific-Industrial Association "Sibtsvetmetavtomatika" (Automation of Siberian Nonferrous Metallurgy)

[Abstract] The use if IR imagers, optoelectronic devices producing a visible analog of infrared images and operating like television cameras, is evaluated from the standpoint of application in the aluminum industry. IR imagers which are particularly suitable here are those producing 25-50 frames/s with 100-400 lines per frame and covering a temperature range from -40 to +2000°C. The temperature distribution over a surface can be displayed in black-and-white or in color, along marker lines, and with a calibrated brightness scale ranging from minimum to maximum. The mean temperature of a surface can be indicated by a digital readout and isotherms can be represented as isophotic zones. The image can be normal representing the hot parts of an object, and negative representing cold parts of an object, absent for display of isotherms only, and stepped for automatic discretization of the temperature range. Such IR imagers as the AGA-782 with built-in temperature etalons and in combinations with computer microprocessors have been used experimentally in the Krasnodar Aluminum Plant imeni 50 years of VLKSM (All-Union Lenin Young Communist League) and in the Achinsk Alumina Combine, in the former first used for thermography of electrical equipment including rectifier substations and rectifier bays, high-voltage substations, busbars, oil circuit-breakers, disconnect switches, and electrolyzers. Preventive thermography was found to save here annually 23,000 rubles worth of emergency repairs and replacements as well as 22,080 rubles worth of energy waste in poor contacts, with an IR imager costing only 1,000 rubles for maintenance and 6,240 rubles for depreciation annually based on recovery of capital investment within 8-9 months. Thermography of mechanical equipment such as electrolyzer lining, sintering furnaces and annealing furnaces, also for product control in hydrolizers, electrolyzers, and in fluidized beds before and after cooling has so far yielded an annual saving of 69,850 rubles which would be spent on emergency repairs and wasted metal (aluminum) in the Krasnodar plant. In the Achinsk plant the annual saving in firebrick lining and fuel oil for fur ces is estimated at 23,386 rubles and 15,146

rubles respectively. One major problem is thermography of rotating furnaces, which requires a special computer for processing analog IR imager output signals and a special moving cage for the thermograph with accessories to follow such a furnace. References 2: 1 Russian, 1 Western (in Russian translation).
[50-2415]

USE OF MODULATION METHOD TO DETERMINE RELATIVE EXCITATION IN GAS LASERS

AKCHURIN, G. G., SINICHKIN, Yu. P. and TUCHIN, V. V.

[Abstract] The simple modulation method often used for determining relative gas laser excitation by perturbing the discharge current is augmented with measurements of the output power and its variable component in relative units for two cavity loss values with the same discharge current. This modification permits the method to be used in regions in which the relationship of the output power and discharge current is nonlinear. The output power and gain of an Ar^+-laser operating at 0.48 μm are computed as a function of the relative excitation; the relative excitation is also computed as a function of the discharge current. The results of these measurements and their processing are presented in tabular form. Figures 3; tables 1; references 5: 4 Russian, 1 Western.
[6-6900]

INTEGRATED ELECTROOPTICAL MODULATOR OPERATING AS AMPLIFIER

KLIKUSHIN, Yu.N.

[Abstract] The performance of an integrated electrooptical modulator as an amplifier is analyzed, the particular device consisting of a Mach-Zender interferometer with two waveguide branches between a common optical entrance and a common optical exit, a pair of electrodes, a photodiode photoreiver, and a load impedance. It operates with a radiation source and an electric signal source in front of the waveguides and a constant-voltage bias source behind the waveguides. The electric field of the electrodes, produced by both signal and bias sources, modulates the refractive index of the electrooptic waveguide material through the Pockels-effect mechanism. The amplifier input

impedance is capacitive because of the electrooptical effect. The trans-conductance and the ripple factor of this device are calculated with the aid of an approximate equivalent electric circuit which includes the differential internal photodiode resistance based on an exponential current-voltage characteristic. The results indicate that the nonlinear distortion of the output signal is one order of magnitude smaller than that of a signal of the same amplitude amplified by a field-effect transistor at the same operating point. A typical application is a push-pull amplifier with a balanced integrated interferometer. Doubling the transconductance by the addition of a second photodiode in parallel for the alternating current component, however, does not produce a higher intrinsic gain and a larger bandwidth because as a result the internal modulator impedance decreases and the output capacitance increases. Advantages of such an amplifier are the possibility of phase inversion by 180° through reversal of the bias voltage polarity and the availability of a gain margin for improvement of static and dynamic performance by introduction of negative feedback. The voltage gain depends on the load resistance, however, and the latter must be higher than the reciprocal of the transconductance if amplification is to occur. Figures 3; references 11: 4 Russian, 1 Bulgarian (?) (in Russian translation), 6 Western (3 in Russian translation).
[310-2415]

OPTICAL PROCESSING OF SIGNALS FROM LINEAR ANTENNA ARRAY BUILT WITH OPTICAL-FIBER SENSORS

LINCHEVSKIY, I.V., STEFANOVICH, Yu.T. and SHMAREV, Ye.K.

[Abstract] The design and the performance of an antenna array built with single-mode optical-fiber sensors in a coherent optical receiver-transmitter-processor channel are analyzed, assuming that one laser serves as the common excitation source for all the transducers. An optical-fiber cable feeds signals from the transducers into an optical processor consisting of a colli-mator lens, a set of acoustooptical modulators, a Fourier lens, a collector lens, and a photoreceiver array built with charge-coupled devices. A reference light beam from a separate source also impinges on the photoreceiver array. The operating principle of such a system, designed for wideband input signals, is based on acoustooptical interaction in optical fibers. The transformation of an incoming signal by the various system components is traced analytically and the space spectrum of the output signal in the photoreceiver array is calculated, considering that the electric field component of light waves is nonlinearly dependent on the acoustic pressure and taking into account the sensitivity of optical fibers to external pressure as a function of their design parameters. The processor performance is evaluated on this basis for the specific case of two acoustooptical modulators with a small modulation

factor integrating an input signal with linear frequency modulation $f_1(t)=$ 2 cos $(\omega_0 t + \frac{1}{2} bt^2)$, the subsequent extraction of the envelope of inter-ference fringes for information retrieval, and use of the zero-order diffraction peak for extraction of the error signal. Figures 3; references 8: 4 Russian, 4 Western.
[310-2415]

OPTIMIZATION OF CAVITY OF FAR INFRARED SUBMILLIMETER-BAND LASERS

KUKHTA, A. V.

[Abstract] The optimum operating conditions of far-infrared and submillimeter gas discharge lasers are analyzed. Expressions are derived for the relation-ship between the output of the lasers and the geometric dimensions of the cavity for homogeneous as well as heterogeneous amplification line contours. The three basic types of cavities employed in practice are examined. The optimum operating conditions of an H_2O continuous laser operating at 27.97 μm are analyzed. An H_2O wave guide laser is described, and the findings of an investigation of its characteristics are presented. Figures 6; references 8: 3 Russian, 5 Western.
[6-6900]

SOLID STATE CIRCUITS

LOGIC ELEMENTS FOR SYSTEMS WITH VARIABLE STRUCTURE

GOLIK, L.L., YELINSON, M.I., PEROV, P.I. and SHAROV, A.M., Institute of Radio Engineering and Electronics, USSR Academy of Sciences

[Abstract] Logic devices for adaptive systems with variable structure are synthesized with the consideration that such systems require a distributed controllable memory and a distributed adjustment control for individual components. The basic logic device is considered to be a universal one capable of computing any Boolean function and equipped with a local memory array as well as with a local mechanism for adjustment of its parameters. A multiple-input universal logic device is constructed, accordingly, using one decoder and two parallel-action read-only memories. Recording and erasure in a memory cell require special control elements, output signals from the memory of states proceeding to the memory of connections. Two classes of variants can be developed from a flexible basic structure, namely devices with and without weighting of the input data. Weighting for simple logic devices can be done by majority gates or by comparators. A more complex refinement is a read-only memory with not one but p rows of cells. Other variants in this class are a simple threshold device with memory and a more complex one with different thresholds in the various weighting circuits, the most complex being a logic device with discrete weighting of the decoder input variables. All these variants can be designed for special signals unconditionally switching off any given weighting circuit. In the second class of logic devices are one with each input variable encoded in an m-bit word and a linear threshold device with fixed weights of codes. On the basis of such devices, systems are synthesized for solving prediction, identification, and control problems, such systems requiring devices capable of computing linear and nonlinear functions of input variables in either continuous or discrete output form. Construction of these systems is facilitated by use of homogenous array structures such as adders and multipliers, and use of problem-oriented microprocessors with microelectronic components. In the design process it is necessary to estimate the quality of the state at any given instant, typically characterized by the system error at that time. This is done, considering that all known statistical criteria for sequences of binary quantities are

functions of two parameters: frequency of single bits and length of sequence. Group criteria rather than individual criteria are applied to this case. Figures 4; references: 7 Russian.
[312-2415]

621.382.8.001.2

TRENDS IN DEVELOPMENT OF SOFTWARE FOR COMPUTER-AIDED ANALYSIS OF LARGE-SCALE INTEGRATED CIRCUITS

Abstract The fundamental mathematical model of integrated circuits is a system of ordinary differential equations. Computer-aided analysis of such circuits requires numerical integration of these equations. For small-scale integrated circuits in the initial stage of development during the 1960s this was done by explicit methods incorporated in the first-generation software. Step-up to medium-scale integration during the 1970s required more adequate algorithms and implicit methods replaced explicit ones in the second-generation software. As the trend continues into large-scale integration and toward very-large-scale integration, still more efficient algorithms are needed and are being proposed for the third-generation software. Hybrid logic-electric circuit simulation is one approach, namely splitting the LSI circuit into two parts representable by logic equations and ordinary differential equations, respectively. This approach should lead to multilevel restructurable mathematical models with various appropriate representation of circuit fragments. One trend in simulation of LSI circuits is the use of macromodels, such a model constituting the optimum tradeoff between the two mutually contradictory precision and economy requirements. Another trend in simulation of LSI circuits and then VLSI circuits is application of the diakoptic method, implementable in three ways: 1) Solving systems of linear algebraic equations by the Gauss method and reconciling the results after complete successive elimination of all fragments; 2) Solving systems of finite equations by the Newton method and reconciling the results after satisfying the convergence conditions for all fragments; and 3) Separately integrating subsystems of ordinary differential equations and reconciling the results after a series of steps in each fragment. For analysis of integrated circuits it is expedient to combine, when appropriate, adaptive and cyclic methods. Various techniques of reducing the complexity are known, among them thinning out the Jacobian for solution of a system of finite equations according to an iteration formula. Figures 1; references 10: 6 Russian, 4 Western.
[312-2415]

SONICS & ULTRASONICS

SPREAD FUNCTION OF ACOUSTOOPTICAL MODULATOR WITH HYPERSOUND GENERATED BY
DELAY SYSTEMS

ZYURYUKIN, Yu. A. and USHAKOV, N. M., Saratov State University

[Abstract] An analytical expression is derived for the spread function of a
real acoustooptical modulator employing a delay-system based piezoelectric
transducer. An expression is then obtained from the general analytical spread
function for the angular and frequency errors of the modulator. The angular
error of an acoustooptical modulator whose equivalent circuit can be repre-
sented as a network of low-pass filters is analyzed as an example. The beha-
vior of the spread function for angular and frequency error makes it possible
to estimate the basic parameters of acoustooptical modulators employing
transducers based on any type of delay system quickly and rapidly, which is
important for developing microwave acoustooptical devices. Figures 3; referen-
ces: 2 Russian.
[33-6900]

81

TRANSPORTATION

PROVING GROUND FOR TESTING PROPULSIVE LINEAR INDUCTION MOTORS

SHINKARENKO, V.F. and KAMRAT, A.A., engineers, Design Office, LED (possibly Linear Electric Motors)

[Abstract] Development of propulsive linear induction motors for high-speed ground transportation requires not only extensive laboratory experiments but also thorough field tests under actual operating conditions in order to ensure satisfactory correspondence between design and performance. A proving ground has been built for this purpose, with facilities accommodating 100-1200 kW drives at speeds of 36-450 km/h. These facilities are designed for all three successive stages of the development engineering process: 1) Static and dynamic laboratory testing of scaled-down physical models; 2) Static testing and experimental circular running of full-scale prototypes; 3) Experimental straight running of linear induction motors for evaluation of their compatibility with other components of passenger and freight transportation systems such as rolling stock, roadbed, power supplies and controls. The proving ground has been laid out accordingly, to include universal test stands for rotary and translatory motion, a 2000 m long roadbed with rail for testing single-sided linear induction motors, a 670 m long roadbed with trestle for testing double-sided linear induction motors, a 1600 m long universal roadbed and a 125 m long roadbed with trestle for dynamic tests. The power supply comes from a 110/6 kV - 12,600 kVA substation containing five 3-phase a.c. sources with voltage regulation (220, 380, 600, 860, 2400 V), two 3-phase a.c. sources with voltage and frequency regulation (0-380 V/0-70 Hz, 0-1500 V/0-80 Hz), and two d.c. sources (460, 900 A). Linear induction motors with ratings of 120, 420, 600, 800, and 1200 kW for passenger trains were tested on this proving ground during the 1977-82 period. Figures 4; references: 6 Russian.
[315-2415]

NEW ACTIVITIES, MISCELLANEOUS

ACTIVITIES AT CENTRAL ADMINISTRATION OF THE E:EP SCIENTIFIC AND TECHNICAL
SOCIETY AND USSR MINISTRY OF ELECTRICAL-ENGINEERING INDUSTRY

RYZHNEV, Yu.L., chairman, Central Commission on Summary of Inspection Results,
and YUZEFOV, Scientific Secretary of Commission

[Abstract] Both the central administration of the NTO E:EP [Scientific and
Technical Society of the Electrical (?) and Power Industry] and the USSR
Ministry of the Electrical-Engineering Industry have evaluated the results
of the 1983 annual All-Union public inspection concerning implementation of
scientific and engineering achievements by the electrical-engineering industry
according to plans. The results of this evaluation reveal an increasing
activity in all primary enterprises of the NTOs, according to the reports
collected from over 52,000 staff members of the NTOs of 610 primary organi-
zations of the electrical-engineering industry. More than 7,500 suggestions
and proposals for speedy resolution of technical and management problems were
reviewed. Evidently scientific-research and engineering-design departments
have been following the implementation plans at an accelerated pace in
activities such as building experimental prototypes of new devices and pro-
ducing new materials, mechanizing and automating production processes,
reducing the length of the invention-to-production cycle, and improving
product quality. Several prizes were awarded in recognition of outstanding
effort: the first prize was received by the primary organization NTO E:EP of
the Mayli-Say Electric Lamp Plant imeni 50-years of the USSR; the second
prize was shared by the primary organization NTO E:EP of the Saransk plant
"Electrical Rectifier," the Kamsk Cable Plant imeni 50-years of the USSR,
the Baku Home Air Conditioner Plant, and VNIPTIEM (?). The third prize was
shared by the primary organizations NTO E:EP of the Mozyr Cable Plant imeni
XXV Congress of the CPSU, the Kineshma "Electric Contact" Plant, North-East
Industrial Combine "Transformer," Kursk Industrial Combine "Electrical Equip-
ment," the Vilnius Electrical-Engineering plant "El'fa," the VNIIEMI (All-
Union Scientific-Research Institute of EIM (possible Experimental Information
Machine) and others. Certificates of recognition were issued to 31 primary
organizations of NTO E:EP.
[315-2415]

PROPERTIES OF BURGER'S TURBULENCE AT THE STAGE OF INTERACTION OF SHOCK FRONTS

GURBATOV, S. N., DEMIN, I. Yu. and SAICHEV, A. I., Gorkiy State University

[Abstract] It is demonstrated that during the propagation of random waves
whose spectrum contains low frequency components it is possible for a wave
propagating linearly to become highly nonlinear. It is shown that a strongly
nonlinear condition, i.e., a chaotic sawtooth wave mode, can be realized early
or late for Burger turbulence even when the initial Reynolds number is much
smaller than unity. A numerical example is presented. It is found that the
presence of spatial components with arbitrary large periods, with the effective
Reynolds number increasing as the period of each component becomes smaller,
causes Burger turbulence to become strongly nonlinear regardless of the
initial Reynolds number. The authors thank A. N. Malakhov for helpful
discussion of the work. Figures 2; references 7: 3 Russian, 4 Western.
[33-6900]

TOWARD A THEORY OF TRANSIENT SOLITON EMISSION IN UNSTEADY MEDIUM

ABDULLAYEV, F. Kh. and DZHANGIRYAN, R. G., Department of Thermal Physics,
Uzbek SSR Academy of Sciences

[Abstract] The radiation field in an unsteady medium is investigated for
sine-Gordon equation dynamics. The field and radiant energy are found for
different media. Models are investigated which reflect an abrupt change in
the characteristic frequency over time; a pulsed change in the properties of
the medium; gradual change in the properties of the medium; and periodic
modulation of the frequency $\omega(t)$. An expression is derived for the non-
Newtonian dynamics of the sine-Gordon soliton in a periodically unsteady
medium during the initial period of movement. The authors are grateful to
B. M. Bolotovskiy, V. G. Makhan'kov and L.A. Ostrovskiy for helpful discussion.
References 10: 6 Russian, 4 Western.
[33-6900]

PROTECTIVE-DECORATIVE FINISH AND QUALITY OF ARTICLES

ARISTAKESYAN, M. G., chief, Protective-Decorative Material and Coating Section, Armenian Branch, All-Union Scientific-Research Institute for Engineering Esthetics

[Abstract] Recommendations are presented for the selection and use of decorative and finish materials and coatings for consumer electronic equipment. The use of ADS and AVS plastics, as well as shock-resistant polystyrene and MSN copolymer for radio equipment is discussed. The use of plastic surface texturing, metallizing, energizing and lacquering is described. [23-6508]

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